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PETROLEUM.

RECENT FORMATION OF PETROLEUM.

The subject of Petroleum seems to acquire new interest every hour—every day new capital and new men with new energy and tact, are seizing the lever which is raising this new—to this country—branch of industry into merited importance. Fortunes have been made in so short a time in this business, that it is no subject of wonder that much anxiety is manifested to acquire an interest in oil-bearing lands.

The use of oil, instead of coal, as a means of driving steam engines, has been frequently suggested, and there needs but a few experiments to demonstrate its economy It has always been the opinion of the writer that coal was entirely too bulky and clumsy for the purposes of ocean navigation, and while the use of oil would involve a greater complication of machinery, the convenience in handling, the economy of stowage room, and the additional safety of a material so concentrated and under the control of the operator, must make the change from anthracite to oil in the highest degree desirable. Ere long, no doubt, inventive talent will have accomplished this object, whereby the public will be benefitted in two ways: first, by acquiring an addition to the stock of fuel; and second, by holding the means of restraining the rapacity of coal monopolists. Perhaps the most valuable information to those interested in oil bearing lands, or those about to become so, as well as to the general public, would be some data to assist in explorations—some hints that would assist the land purchaser to ascertain, with a degree of certainty, the existence of oil in lands submitted to his inspection.

We have combated the views of some writers on Petroleum, who insist that it owes its origin to the vegetable matter contained in the shale-beds of the Silurian system. These writers do not admit the possibility of the formation of this compound at recent date, and suppose it to have been distilled by subterraneous heat into the upper strata, and to have remained in its present situation for ages.

But that the formation of Petroleum is of recent date, we must conclude from the history of trees. Thus, in the graywacke period we find the palm does not exist, and we have no account of its presence in the coal formations, while in the present or historic period, a thousand species are known. So willows, poplars, maples, oaks, magnolias, sycamores, etc., all belong to the tertiary and historic period. But marine and flowerless plants were abundant in the graywacke period. Again, the *sigillariæ* (so called from impressions on the surface resembling a seal,) large trunks of which, from half-a foot to three feet in diameter, and from 50 to 60 feet long, covered with flutings and scars, have long been known in the coal formations, and are supposed to be the principal source of the beds of coal in the coal measures. These are traced to the carboniferous period only, and are now entirely extinct. The *stigmaria*, another fossil, three or four feet in diameter, with branches from 30 to 40 feet long, probably the roots of the *sigillariæ*, is found beneath the coal beds. This also belongs to the carboniferous period, and is now extinct. Many other extinct genera, similar to the sigillariæ, occur in the same rocks, and belong most probably to the conifera, and are well known in the coal formations. So the *lepipodendron*, a genus entirely extinct, which is abundant in the coal formations, is found from 20 to 40 feet long.

By far the most numerous of the plants found in the coal formations belong to races now extinct, and this would lead to the impression that coal only remains of the decomposed vegetable matter of the early periods of the globe's history. Although vegetation was much more abundant than at the present day, it does not seem reasonable that the oil which it contained, and which was liberated on its submersion, would remain so long a time without change, and be distilled into the upper strata, and there remain, without alteration, for so many ages. Indeed, it would be impossible for a substance like Petroleum to exist for so long a time without change, as its constituents are of a nature which forbid any combination so permanent. The hypothesis which we shall adopt, in view of the facts just stated, is, that the hydrocarbons of the vegetable matter of the early periods have been oxidised, and now form coal; and this view is strengthened by the fact that nearly all the plants found most abundantly in the coal formations belong to extinct races.

Now, it takes a much longer time to form coal than it does to form oil, and we cannot think that oil, one of the products, would remain in *statu quo*, while the plants from which it was derived have not only become coal, but even their very race become extinct—and yet some geologists favor the opinion that Petroleum is derived from the remains of those extinct plants.

The formation of peat, a very abundant substance, goes to show that vegetable matter and its products cannot long remain in a state such as that in which Petroleum is found, without change. If vegetable matter be exposed to a certain degree of moisture and temperature, it is decomposed into the substance called peat, which is dug from swamps, and belongs to the alluvial formation. Lignite, or brown coal, the most perfect variety of which is jet, is found chiefly in the tertiary strata and the higher secondary, and appears to be peat, which has long been buried in the earth, and has undergone certain chemical changes, whereby bitumen has been produced. Bituminous coal appears to be the same substance, which has been longer buried in the earth, and has undergone still further changes, though their precise nature is not well known. Its principal deposit is in that part of the secondary series called the coal formations, or coal measures; but it occurs in the new red sandstone series in England, Poland and Massachusetts, and in Scotland it is worked in the lias limestone. A thick bed of it has also been found in the plastic clay of the tertiary strata in Germany.

The principal deposit of anthracite in Europe is in the graywacke formation, and it is supposed that this substance is common coal, which has undergone still further changes, and lost its bitumen. Prof. Brogniart describes a true anthracite as occurring in the plastic clay of Mount Missner, in Hesse. This appears to have been formed from bituminous coal by the action of igneous rocks, and such cases have led some geologists to suppose that anthracite was always thus formed.

Peat usually consists of soluble and insoluble geine, with a mixture of undecomposed vegetable matter, and some earth—most of it results from the decomposition of certain mosses, especially of the genus sphasnum, which decay at their lower extremity, while the top continues to flourish with vigor. Trees, and whatever other organic matter happen to get into the peat bogs, soon become enveloped, and assist to swell the amount. In some instances, the beds have acquired a thickness of more than 40 feet. In tropical climates, except in high lands, the decomposition of vegetable matter is so rapid that it is resolved into its ultimate elements before peat can be produced. Hence peat is limited chiefly to the colder parts of the globe. In Ireland, the peat bogs are said to occupy one-tenth of the surface, and one of them, on the Shannon, is 50 miles long and 2 or 3 broad. By the long continued action of water and other agents, the geine of peat is changed into bitumen, and carbon, which constitute lignite and bituminous coal. In a few instances, the process of bituminization has been found considerably advanced in the bed of peat. Drift wood is also a source of coal and Petroleum. Large rivers, in passing through vast forests carry with them immense quantities of timber of all kinds. When they overflow their banks, much of this timber is deposited on the low lands, a portion being carried to the ocean; getting saturated, it becomes water-logged, and sinks to the bottom; this is afterwards covered with mud, and then another layer of wood accumulates over the mud, so that in the course of ages, several layers of alternate wood and mud accumulate. This wood is slowly changed into a substance resembling peat, which in course of time is still further changed into coal. We here see the origin of the beds of coal which exist in the older strata, for the bituminization of the peat and consolidation of the mud would produce genuine coal beds. Clay exposed for a long time to the sun becomes as hard as some rocks. The marly clay dug from the bottom of Lake Superior has this quality. Again, some rocks, coming from considerable depths in the earth, are so soft as to be cut easily with a knife, but become very hard on exposure to the atmosphere. Facts like these go to show that the transformation of wood to peat, and from peat to coal, is comparatively simple and easy. The solution of the carbonate of lime becomes cement on a large scale in some localities. In Vermont large masses of drift wood are seen, which have been cemented together by carbonate of lime. On the shores of Bermuda, vast accumulations of broken shells, corals and sand are formed upon the shores by the waves, which are subsequently consolidated into hard rock by the infiltration of the water containing carbonate of lime in solution. The famous Guadaloupe rock, in which human skeletons, along with pottery, stone arrowheads, etc., are found, is of the same character.

The Mediterranean delta of the Rhone is said to be solid rock, produced by the many springs which empty into it containing carbonate of lime in solution. A similar state of things exists at the mouths of some of the rivers in the southern part of Italy and on the east coast of the Mediterranean, where the ancient Sidon, formerly on the coast, is now two miles inland. Of the drift-wood accumulations, the Mississippi furnishes the most remarkable examples known. I consequence of some obstruction in the river Atchafalaya, supposed to have been formerly the bed of the Red river, a raft accumulated in 35 years, which in 1816 was 10 miles long, and 220 yards wide and 8 feet thick. Although floating, it was covered with living plants. Similar rafts

occur in the Red river, and one on the Washita completely concealed on the surface of the river for 17 leagues. At the mouth of the Mississippi, numerous alternations of drift wood and mud exist, extending over hundreds of square leagues. Here we have the nuclei of enormous beds of coal and reservoirs of oil, to be developed in future ages. In the River Mackenzie, which empties into the North sea, similar deposits of wood and mud are found, as also in the lakes through which it passes. At the mouth of this river, which is almost beyond the region of vegetation, are extensive deposits, brought from the more southern regions through which it passes. Drift-wood, which is brought down by the Mississippi and other rivers along the coast of America, is carried northward by the Gulf stream, and thrown upon the coast of Greenland. The same thing occurs in the bays of Spitzbergen and on the coasts of Siberia. Now what becomes of the hydro-carbons of these vast masses of wood, if the present supply comes exclusively from plants whose very species have long since been extinct? What has become of the hydro carbons from the many forests that have been submerged?

The solution of these questions can only be found in the hypothesis that entire submersion in water is most favorable to the formation of coal. While simple exclusion of atmospheric air, with presence of water, is more favorable to the formation of Petroleum. Indeed, the absence of alkaline matter in coal ashes goes far to establish this. And when it is recollected that every year vast masses of wood are sunk in the lakes, streams and seas, which are covered with mud, which is again covered with wood, and again with mud, we can understand how the alkaline matter could be dispersed by water, while the carbon remained, forming beds of coal. On the other hand, if we suppose a forest to be buried to such a depth as merely to exclude the atmospheric air, with presence of water, the products of decomposition would be both coal and Petroleum. Decomposition requires air and water, and this condition is present in both instances, as water contains air, though in limited quantity.

The first step in the decomposition of wood is the formation of carbonic acid—the potash exists as an insoluble silicate—the carbonic acid is the solvent of this so that wood may be said to contain its own solvent, so far as potash is concerned. Not so, however, with lignin, which is entirely insoluble in water. Lignin, or wood, is changed by sulphuric acid into gum, and those lands bearing oil are the very ones most likely to contain gypsum, a compound of sulphuric acid and lime. Whether the sulphuric acid existing in these localities has any influence on the decomposition of the wood, must be determined by future investigation, and we shall reserve its consideration for a future number; but we may say here, that the fact of the occurrence of gypsum and rock salt together, would create the impression that the formation of Petroleum is largely influenced by gypsum; rock salt and gypsum are frequent companions, as are rock salt and Petroleum, and if we adopt the opinion that Petroleum is influenced in its formation by gypsum, we can readily account for its presence without supposing it to be distilled from the shale-beds.

Let us suppose a beech forest of a thousand years standing to be replaced by other races of trees, in accordance with the law of rotation of trees, the accumulation of leaves, branches, twigs, trunks, etc, which have been buried in a gypsum locality—the water to be sufficient for the decomposition of the wood—the potash dissolved out—the hydro carbons liberated as Petroleum, leaving the lignin to become coal—new gypsum is readily soluble in a sufficiency of water, and a portion of the sulphuric acid of the gypsum would seize the lignin and convert it into gum; this, combined with the hydrocarbons as Petroleum, would form a substance analogous to the crude Petroleum of Oil creek.

This hypothesis is more in accordance with chemical and geological laws then that advanced by Prof. Rogers and the Canadian geologists, and more in accordance with the impressions likely to be formed by the casual observer. Should we establish its truth, as we think we can, it will furnish one hint to enable the prospector to detect the presence of Petroleum.

It does not follow that because coal is commonly the result of the decomposition of wood, that it is always so; the nature of those resulting compounds must be influenced by the substances with which the decomposing material is in contact. Decomposing wood under water may produce coal or Petroleum, or both—but decomposing wood in contact with sulphuric acid or water must produce gum and Petroleum, or crude Petroleum. Gypsum is found chiefly in the new red sandstone series, spreading thence through the lias, oolite green sand and into the tertiary strata—the very position of the Petroleum of the present day. These are also the principal localities of the rock salt, which so frequently occurs in company with gypsum. In a previous number we said that Petroleum could be formed at any time and in any locality, the favorable conditions being present, and we say so still; its abundance, however, will always be regulated by the substances by which the materials from which it is derived is surrounded.

Chemical geologists, in theorizing upon the origin of Petroleum, have presented, with their diversity of views, many facts which have a better significance than the writers' teachings. Prof. Lesley does not endorse the views of Dr. Hunt, that the accumulations of oil now furnishing the world with light, have not come from the sub-volcanic distillations of the beds of coal in their neighborhood, but that the mineral has been generated by the transformation of organic matter in the strata where it is. Prof. L. however, remarks on the origin of the oil: "The fossiliferous black shales of the State of New York, underlie Lake Erie, cross Ohio and Kentucky into Tennessee, and return through Indiana, and form the beds of Lake Michigan and Huron." In middle Kentucky the faces of the rocks are smeared and streaked with oil fried out of them by the sun, so that the surfaces are blackened as if with tar.

"Up to the horizon of these black shales, ascending in the column of deposits, gelatinous sea organisms, both animal and vegetable, seem to have constituted the principal if not the sole apparatus for generating Petroleum. But Dawson has lately discovered in the sandstones over them, a true angiospermous, exogenous tree, not much, if any, lower in the scale of development than those of which our forests are composed. Coniferous trees began also to abound, and coal beds to be deposited in groups. Thence the higher we ascend, towards, and through the second and third, or great coal measures, the more abundant become the vestiges of fresh water and land vegetation, until in the tree stumps of the coal beds of Nova Scotia, we find small land animals. The mosses, and ferns, the rushes, and reeds, minute and gigantic, of which the coal beds came, suggest the vegetable origin of coal oil. . . . . Black slate cannel fat coal, like lignite, peat and living wood, will yield the oils and gasses by distillation."—*American Exchange and Review.*

Petroleum has been discovered at a place called "Mud Creek Hollow," near Bristol, Ontario county, N. Y. A company has already been formed for developing the hitherto concealed treasure. The discovery was made at a distance of seven hundred feet from the surface of the earth. The oil is described as resembling the petroleum discovered in Canada. Bristol and the vicinity are of course thrown into great excitement by this new addition to its prospective wealth.

Singing Fishes.—Dr. Dufosse has communicated to he French Academy an account of certain researches which he has recently made into the vocal powers of fishes. His observations have been confined chiefly to the species Trigla and Zeus—gurnards and dories. He ascertained that the sounds proceeded from the vibration of the muscles belonging to the air-bladder, and that in some of the former these sounds may be heard six or seven yards.—The sounds were both short or instantaneous and prolonged; the pitch often varying during a single "sonorous emission." In some instances a large number of completely distinct sounds were produced, variously modulated.

MINING.

ON THE MECHANICAL DRESSING OF ORES.

Having already considered some of the forms of machine for comminuting ores, we have still another class of machine for the same purpose, the object of which is to comminute the ore to a state of fine division without pulverizing it to a powder. The machines to which we refer are called stamps, and have been employed by miners for years, and even centuries, and have been universally found satisfactory, for two reasons: firstly, because they get through a greater amount of work in proportion to the power employed than any other machines; and, secondly, because they comminute the ore without reducing it too fine. In considering these machines from a general point of view, we may say the stamps are made of a heavy mass of cast-iron, placed at the base of a lifter of wood or wrought-iron; and three or four of these being placed together in one case form a battery or set; and, when few in number, may be worked by water-power, and when multiplied are usually worked by powerful engines. In olden times stamping machines were made very coarsely, and there were usually three heads in one box; but the heads were irregular in form, and consequently the stuff was most unevenly broken up. In treating of stamping machines we will consider them under the following divisions:

1. The form of the stamp-head. 2. The lifter. 3. The means for raising the lifter. 4. Kofer. 5. The frame in which the stamps are fixed. 6. The mode of outlet for the stamped material. 7. The barrel by which the stamp-heads are raised.

First, then, of the stamp-head. These should generally weigh from one to one and a half ton for ordinary stuff, although where the rock is very hard the weight must be increased to five and even six cwts. In most cases the stamp-heads are of cast-iron, and eighteen to twenty inches in length. The heads, as commonly made in the foundry of the present day, are cast with a shank, by which the lifter may be very readily attracted to the head.

Secondly, of the lifter, which was made invariably in olden times of wood, deal, pinewood, or ash being generally preferred. This sort of lifter, is, however, now-a-days invariably made of iron. The weight of the lifter is a matter for consideration; an extra weight in the lifter certainly tends to give a more uniform blow, and for this reason iron lifters would seem to be preferable. We must, however, allow that iron lifters are liable to get thrown out of shape after some use. Wooden lifters are generally considered preferable to iron ones, since they work more evenly and produce less friction. Some excellent examples of wooden lifters may be seen at the Charleston United Mines.

Thirdly, as to raising the lifter, we find the head most effectually performs its functions when raised from ten to twelve inches. The lifting is effected by means of what is called a tongue, of which the best are made of iron. One end of the tongue passes through a slot in the side of the lifter, and is there fixed with wooden wedges, and the whole kept tight by a wedge, binding the end of the tongue which has passed through the lifter. The lifter must be retained in its position on either side by braces. Now, on raising the lifter a rotatory motion is necessarily given to it, which causes a great amount of friction, and to avoid this numberless devices have been proposed; one was to make a hole in the lifter into which the cam raising it should fit; such an idea, however, cannot be entertained, as the arrangement must so materially weaken the lifter. Another proposal has been to raise the lifter by a double cam, one arm passing on each side of the lifter. We cannot see, however, that such a device can at all diminish the friction. The question then arises, what are the best means of avoiding friction? We think, by adopting the following simple means, common on the Continent, and sometimes seen in England, a great deal may be prevented. The plan is to place between the bearing parts of the frame and the lifter long thin slips of wood, which, if kept well greased, will act as

slides. In the tin districts it is more usual to supply a guide made of a triangular piece of iron fixed by screw bolts into the pieces at the back of the brace up which the lifter slides. An Australian form of stamps has lately been brought out as a great improvement. Its peculiarities are, that both the lifter and head are of circular iron, and its so-called advantages that a rotatory motion is given to the head as the cam lifts it. For many reasons, and some of which we have enumerated above, this motion is peculiarly objectionable, and we may consign this machine without hesitation to the limbo of obscurity.

We now come to the kofer and frame, which we may truly say constitute the most important parts of the stamps. The whole frame is universally based on some good concrete, and is divided into partitions by uprights. The kofer may be looked on as a box of wood of any convenient form, the most important part of which is the arrangement for allowing the escape of the ore directly it is reduced to the proper state of fineness, since, if kept in the kofer beyond that time, there must of necessity be a loss in the finer particles of the ore. Now, the escape of the ore is usually effected through a grating, of which there is one in front of the kofer, and one at each end. As the stamp-head, after being lifted, descends, a wave will be produced in the contents of the kofer, which, in its passage, will carry through the grating the comminuted particles. There are other forms of kofer, where the ore escapes over the top of the box, but this form is used only when it is required to stamp very fine. Sometimes the ore escapes through a slit in the upper part of the kofer, which is termed "stamping in the flash." In Hungary they have a very nice way of regulating these flash stamps, by placing a little slip door between the slit and the stamp-head. There is no part, be it remembered, of the stamping process which requires such great care on the part of the agent, as the size of grating through which he shall pass the stamped stuff. A great deal depends on it, and experiments should be continually made to arrive at the proper degree of fineness to which it is desirable to reduce any particular kind of ore.

We must now say a few words on the last division of our subject, "The Barrel." It consists of a barrel of cast-iron, with holes in it for the cams, and is cast with proper bearings to fit on plumber blocks. It may be worked by water-power or steam. A stamp, to be working at the greatest speed for perfect efficiency, should lift each head to make from fifty to sixty blows per minute. The quantity of stuff stamped must depend on its hardness, as also on the proportion of water admitted. The number of laborers required to keep stamps in work should be four men to every thirty-two heads. In some Cornish mines there are from 30,000 to 36,000 tons of tinstuff stamped per twelve months.—*Notes from a Lecture by Prof. W. W. Smyth, Royal School of Mines, London.*

NO CAUSE FOR DESPONDENCY.

We take the following from the San Francisco *Mining Press*, of July 9th:

For the last few weeks there has been an absolute dearth of mining news from the various localities within the State of California. Whether this silence is mainly to be attributed to inattention to such matters on the part of local papers, or whether the streams and gulches have completely dried up, from personal observation, we are unable to say. This much, however, we do know; that at no time since 1849, have we heard so little of placer mining in this State as at the present time. Persons from the interior assure us that there is a solemn reality in this condition of things, and that little or no improvement can be hoped for in the way of this description of mining, until the heavens once more open their windows and pour upon us that much needed blessing—water.

The ditches, they tell us, as a general thing, are nearly dry; the reservoirs upon which they have heretofore mainly relied for their summer supply are empty, and, indeed, have not been filled during the past winter. What little rain we had came so late that where it fell upon the mountains, in the shape of snow, it was upon ground not frozen, and hence could not remain a sufficient length of time to fairly "pack," consequently the earliest summer weather soon melted away the yielding mass; and thus this great natural reservoir—the packed snow of the mountains—has proven quite as unreliable as the artificial reservoirs constructed and filled by the hand of man.

Gloomy and unpromising as these facts now appear, at first sight, the picture is not altogether without its brighter side. The daily receipts of bullion from the interior have not yet been affected, except in a favorable manner, while our treasure shipments thus far, for the present year, are largely in excess of the last. From this we may fairly infer that the real and permanent mining interests of the State are beyond the reach of any contingency growing out of the seasons. Our quartz mining interest is that upon which we most depend, and the increased influx of bullion, under the above unfavorable conditions, is one of the most gratifying industrial facts upon which a Californian can dwell. There can be no mistake with regard to its import.

With these facts in view, we can even look upon the present disastrous stock panic as a thing of trifling importance, purely speculative and ephemeral in character, and in no wise endangering the permanent prosperity of this coast.

There is nothing particularly alarming in even the unprecedented depreciation in mining stocks which we have witnessed during the past few months. That some mines on which large sums have been expended have proved failures, and that others have been grossly mismanaged, is a matter to be seriously regretted; but these things establish nothing against the general value of mining investments, so long as the receipts of bullion continue to increase. No one, at all acquainted with mining on this coast, can for a moment doubt that we have opened many mines of great value—many which never have and probably never will be heard of in any of our stock boards; but which will continue for years to yield immense treasures to their fortunate proprietors. More such are constantly coming to the knowledge of those who are in the way of informing themselves in this particular.

As we have already said and repeated in previous numbers of the *Press*, the recent fluctuations and present depressions in mining stocks, will in the end work to our advantage rather than detriment, by putting a check upon reckless speculation, and teaching our citizens to confine their operations and investments to legitimate channels. They will from this experience learn to exercise the same degree of caution in buying mining stocks that they do in making investments in real estate. Let such precaution be the rule, and a death blow will be dealt to wild-cat schemes, and mining on the Pacific Coast will be found as reliable as any other business.

How Granite was formed.—In delivering one of the lectures of the Swiney course at the Royal School of Mines, Dr. Percy objected to the assertion of geologists, that granite rocks must have been formed by plutonic agencies, for, said he, there are certain difficulties which have always been in the way of accepting this view of the subject—difficulties known at all events to those who have been accustomed to make experiments on the fusion of mineral substances at high temperatures. This is especially seen by examining the condition of quartz in granite; it is always found in the crystalline condition, and has invariably a specific gravity of 2.6. There is not a single instance known to the contrary. Hence there is reason to believe that the quartz could never have been fused, for the moment silica is fused, no matter in what condition it was previously, a peculiar glass-like collodial mass is produced, having a specific gravity which never exceeds 2.3. Therefore there is good reason to conclude that granite could never have been formed under the condition of a high temperature.

A nugget of gold was recently found in New Zealand weighing 50 ounces.

GAS.

GENERAL REMARKS UPON WATER GAS.

BY PROFESSOR HENRY WURTZ.

All kinds of illuminating gas, and, in fact, almost all the materials used, or that can be used *economically*, as sources of artificial light, are composed essentially of two only of the sixty or seventy known elements of matter.

These two elements are *carbon* and *hydrogen*.

Carbon is that transcendently important element which forms the fundamental nucleus of everything that has life; of the whole animal and vegetable kingdoms; while hydrogen is the basis of the all pervading substance, water, an indispensable ingredient of the food of all plants and animals. It follows, therefore, in the course of nature and necessity, that in all animal and vegetable matter these two elements, carbon and hydrogen, are found associated together, usually in companionship with more or less of that great Spirit of Life and of Death called *oxygen*.

Both these elements, carbon and hydrogen, when isolated from the oxygen with which they are combined, are found to be susceptible of the phenomenon called combustion, that is of combining again with the oxygen of the air, with production of the apparition called *fire*.

In the case of hydrogen, however, when thus isolated, we find a gas, which burns with great heat, but *no light*; and in order to cause it to evolve light also, some solid body, capable of being heated to whiteness without change, must be introduced into its flame. Carbon is such a solid body.

Among the frugal, though sublime economies of our kind mother, Nature, a most important and admirable provision—one of those special arrangements so clearly intended and devised for the behoof of mankind—is this storing up together, in vegetable matter, of carbon and hydrogen; and our admiration is enhanced, if possible, when we consider that the *relative proportions* in which they are thus stored up are approximately those most suitable for the production of light as well as heat; for had plants contained less carbon and more hydrogen than at present ordered, it cannot be doubted that much more difficulty would have been encountered in providing cheap sources of artificial light As it is, carbon and hydrogen having been thus stored up in the most convenient proportions in such masses, it remains for man, by the application of his intellect—God-given for the purpose—to discover and devise the most advantageous modes of reversing nature's operations, and extracting the pabulum of life and comfort from her complex vegetable productions.

These reflections make manifest to us one of those wondrous harmonies in the grand symphony of creation, one of those "thoughts of God" which are developed to us by science. The sun pours upon our earth intermitting floods of light and heat, and these two principles, so essential to the life of man, are continually being stored up for his use by plants growing in the sunshine, in the forms of carbon and hydrogen, which two elements we may metaphorically call the Spirits of Light and Heat. Thus have wood, and in the lapse of countless ages, coal, been created as vast and practically illimitable reservoirs of fire and light, to be drawn upon during the periodic absences of their primal source, the sun.

It has been found that if heat is applied to these vegetable products, *in a close vessel*, from which the oxygen of the air is excluded, such as a gas retort, it will cause a great part of the carbon and hydrogen to be evolved in combination with each other, forming certain compounds not pre-existent in the vegetable matter. The number of these compounds is very great, and many of them have as yet not been discovered, or isolated. Some of them burn with a brilliant light, others with little or none. Some differ in their proportions of carbon and hydrogen, others form classes precisely alike in these proportions. They are not all *gases*, but many—in fact, by far the greater number

of these yet known—are, at the ordinary temperature, *liquids;* and some of them are *solids.*

It follows, therefore, necessarily, that the substances which pass off from the gas retort, separate themselves, on cooling, at least approximately, into these three classes of products, the liquids and solids condensing together and forming tar, whilst the permanent gases and vapors, incapable of condensation at the ordinary temperature, pass on to the purifiers and gas holders.

Now were this separation a *precise* and absolute one, it would greatly simplify the consideration of these complex phenomena; but it happens in reality that this separation is far from being absolute, the permanent gases always carrying with them, in the form of vapor, and pertinaciously retaining, for a longer or shorter time and in greater or less quantity, according to circumstances, not only portions of the volatile liquid products, but even of the *solid* ones.

In specifying these products by name, we shall be obliged to select those only which possess the greatest interest and importance for us at present, neglecting many which exist in but small quantity.

The *permanently* gaseous products, which are incondensible into liquids at any ordinary temperature are

1.	2.
Acetylene, (in minute quantity,)	Hydrogen,
Olefiant Gas, or Ethylene,	Marsh Gas,
	Carbonic Oxyd, &c.

Of these only those two in the first column burn with a bright flame, the other three burning with pale blue flames, without light, though giving great heat. Acetylene, olefiant gas and marsh gas are composed of carbon and hydrogen, while carbonic oxyd is the form into which the greater portion of the oxygen of the coal passes.

The most important products which, though gases at the temperature of the retort, condense more or less perfectly, when cooled, into liquids, are

1.	2.
Naphtha.	Kyanole or Aniline,
Benzole,	Creosote,
Toluole,	Carbolic Acid,
etc.	etc.

By *naphtha* is here designated the mixture of hydrocarbon liquids more volatile than benzole, which can be condensed from the gas by cold.

The chief solid products are naphthaline, paranaphline, paraffine, &c.

As before stated, it is found that the permanent gases always carry with them, into the gas-holders, in the form of vapor, portions of the naphtha, benzole, aniline, &c. A portion of the naphthaline also—a substance which, though solid at the ordinary temperature, melts and boils at the heat of boiling water—is retained in the form of vapor, and, at times, even found deposited in portions of the gas mains most remote from the works.

To avoid confusion we shall hereafter speak of these vapors collectively as *naphtha vapors.*

All these naphtha vapors, however, condense and separate on exposure of the gas to a sufficient degree of cold; and when it is further stated that the presence of these substances greatly enhances the illuminating power of the gas, the important influence of the extraneous condition of *atmospheric tempreture* on the gas manufacture at once appears. On the one hand it would appear desirable to so conduct the operation as to produce gas richly impregnated with these highly illuminating naphtha vapors; but, on the other hand, the least reduction of temperature would not only diminish the lighting power of such a gas, but would lead to condensations of liquids in the pipes and meters, producing flickerings, sudden extinctions of the burners, &c. It is considered far better to produce the largest possible proportion of permanent light-giving gases, condensible into liquids by no ordinary cold. The element of atmospheric temperature is so important that it is customary to use in the winter season a mixture of materials different from that used in the summer. Thus the New York gas companies use in winter a mixture of equal weights of cannel and caking coal, and in summer but one-third cannel to two thirds caking.

Notwithstanding this, and other precautions, however, the naphtha vapors, during cold winter weather, will condense more or less, and collect in the pipes near the works, and especially in and upon the surface of the water in the huge gas holders, the quantity in time becoming very large and causing very great embarrassment to the manufacturers. Were there any means of drawing off or cleaning out these condensed matters without suspending the use of the apparatus and stopping off the gas, no harm would follow; but as it is, when continued mild weather arrives in the spring, a phenomenon occurs much more interesting to men of science than to the gas consumers and manufacturers, the latter of whom are obliged to listen to the bitter complaints and abuse of their customers, without the power to remedy the evil. In short, the gas then takes up again, in the form of a vapor, the condensed naphtha, but unfortunately in such superabundant quantities that it becomes too highly carbonized, and besides being subject to the embarrassements above mentioned (from recondensation in the service pipes and meters), is liable to burn with a dense flame, giving off clouds of smoke and soot, like raw spirits of turpentine. The only means of rectifying this latter evil is to use burners which would give a smaller flame, a resort to which the consumers usually find highly objectionable.

The influence of temperature upon the proportion of naphtha vapors taken up and retained by the gas, may be made clearer by considering the parallel case of the effect of temperature on *atmospheric moisture.* Every one knows that summer air is usually highly impregnated with water, in the form of vapor, and that the least reduction of temperature causes condensation of this water in quantities; as, for instance, when a glass is filled with ice-water in such an atmosphere. Even the coldest winter atmosphere is susceptible of containing more or less water, in the form of vapor, as any one will admit who recollects having watched a column of escape steam from an engine rising in the atmosphere. Sooner or later, however intensely cold the weather may be, it wholly vanishes, melting away "like the baseless fabric of a vision."

After these preliminary consideratiens, Professor Wurtz gives an abbreviated review of the different plans for making water gas, the earliest case, according to him, of the introduction of water or steam into a gas retort while in action being that of Messrs. Vere and Crane, two English patentees, in 1823, and then proceeds as follows:

"That class of water-gas methods which seems to involve the greatest number of elements of probable practical success, (that, namely, in which the mixed gases produced by the action of steam upon carbon, at an intense temperature, are afterwards combined with the richly carburetted gases and vapors evolved from cannel and similar coals,) has occupied, under the general misnomer of "White's process," much of the attentive investigation of British chemists and gas manufacturers, and very high and enthusiastic hopes have at times been entertained of the success of some of these plans, even by authorities ranking high among practical and scientific men; but, in practice, little or no satisfactory result has ever followed. Some of the many difficulties encountered may be briefly specified. It has been found impossible to convert the steam entirely into hydrogen and carbonic oxyd; however extended the surface of carbon may be to which the steam is exposed, a portion of it is found to escape its action; and this decomposed steam, when passing into coal retorts afterwards, operates injuriously; no doubt by oxydizing the olefiant gas. A portion of carbonic acid gas is also always found with the carbonic oxyd, which is very difficult and expensive to remove, and is very injurious if allowed to remain. One experimenter, Barlow, states, that if all the carbonic acid is removed, his experiments show a gain of 38 per cent. in illuminating power, over the gas obtained in the ordinary way from the same quantity of cannel coal. Dr. Frankland likewise obtained a gain of from 12 to 108 per cent.; while another chemist, equally entitled to credit, so far as we are entitled to judge, Dr. Fyfe, obtained, in every case, a *loss* of total illuminating power, by the water gas process, amounting in the average to 48 per cent., and attributes the diametrically opposite results of Frankland to his far lower estimate as to the total illuminating value of the gas obtained from the cannel in the ordinary way. One of the greatest of the practical objections appears to be *uncertainty as to the quality of the product,* it being impossible to control the process with precision, and the least variation in the mode of operation having the greatest influence on the results."

REMARKS UPON THE STATEMENTS OF DR. WILLIAM ELMER, REGARDING HIS ALLEGED INVENTION OF A "NEW PROCESS OF MAKING ILLUMINATING GAS."

These statements are brought forward chiefly in the form of a pamphlet publication lying before the writer, which is prefaced by some remarks signed by "W. Elmer, M. D." himself, and contains, with other documents, a report superscribed "Constructing Engineer's Office, Navy Yard, N. Y., January 9, 1864," and subscribed "Chas. Hastings, Congressional Engineer," this report being addressed to Rear-Admiral Joseph Smith, Chief of the Bureau of Yards and Docks, Washington, D. C., appearing, therefore, to represent the result of an official government investigation.

The following are a few extracts from this pamphlet. In his preliminary statement, Dr. Elmer himself says: "The new method consists in producing nascent hydrogen, by deoxydizing steam by zinc, forming an oxyd of that metal, while the nascent hydrogen combines with the carbon, producing at least 50 per cent. more gas, without any additional expense, and a gas of three times the illuminating power. The zinc may be disposed of as zinc-white, or reduced to metal again without loss, and again used. The new gas is a chemical compound, while ordinary gas is a mechanical mixture of various substances, which separate in a few days. The new gas is free from the noxious substances always present in gas made by the ordinary method." "Most of the carbon, in the common method of gas making, is wasted, while by the new process, the carbon is utilized, or taken up by the nascent hydrogen, and converted into gas of a high illuminating power."

Mr. Charles Hastings says: "Three retorts are used, the hydrogen retort being charged with pure zinc and superheated steam, the others receiving any carbonaceous material and clean iron turnings. The superheated steam is conducted to the hydrogen retort by a small iron pipe, and is there decomposed, the hydrogen set free, and the oxygen, having a greater affinity for the zinc, unites with it, forming a white oxyd of zinc. This oxyd forms a scale on the surface of the zinc, and at times is broken up and mingled with the metal by a dash. The liberated hydrogen passes into the carbon retorts and unites with the carbon, both being in the nascent state, forming light carburetted hydrogen, olefiant gas and acetylene gas. The gas passes from the carbon retort to the water bath, which washes out the volatile hydrocarbon, and is there purified by dry lime and carbonate of iron, which take up the ammoniacal salts, and sulphur." "Our experiments proved conclusively that Dr. Elmer's gas possessed a power of illumination four times greater than the Manhattan." "A three feet fishtail is the largest ordinary burner Dr. Elmer can use, four and five feet producing imperfect combustion. An Argand burner, with numerous fine apertures, will consume five and six feet per hour in a perfect manner." "Dr. Elmer's gas was found to exceed the Manhattan in durability 28 per cent. The capability of this gas to preserve its character after being subjected to the pressure of a gasometer, and the tempereture of the atmosphere, we could not determine for want of time and the proper facilities."

It is much to be regretted that Mr. Charles Hastings does not furnish us any light upon the composition of the new gas, as determined by analysis, nor even does he tell us what specific gravity it has, nor are there any details to enable us to form a judgment about a most important point, the character and quality of the oxyd of zinc produced, the bearing of which upon the *economy* of the process is clearly of prime importance.

In the absence of other evidence upon this point, I am obliged to adopt some *hearsay* evidence, from a very reliable source, which I have met with, to the effect that this oxydized product is not sufficiently white for a pigment. Indeed, when we consider that in such an operation, the zinc must always be kept in excess, or otherwise the excess of steam would operate most injuriously on reaching the coal retorts (unless a condenser were introduced, which would entail great loss of heat), and consider also the observations of the three eminent chemists Despretz, Wackenroder, and Leopold Gmelin, that when hydrogen comes into contact with excess of oxyd of zinc at a high heat, water is re-produced with reduction of metallic zinc, it is clear that this inverse reaction must inevitably occur in Dr. Elmer's zinc retort, and the resulting zinc white be contaminated with some black powder of metallic zinc.

As to the suggestion to re-distil the metal from this imperfectly burnt zinc and use it over again, it seems improbable that an ore of zinc, produced in this way, would compete in cost with the red zinc ore of New Jersey. Still I am not disposed to deny that this product may not be made available as a pigment, by first grinding and then burning it again in a current of hot air.

Dr. E. designates his gaseous product by the name *Acetylene*, intending, at least, to imply that acetylene is a main ingredient thereof. He says, again, that it is "a compound of three chemical constituents—olefiant gas, acetylene, and light carburetted hydrogen" (marsh gas.) In the absence of any analytical evidence these assertions are open to legitimate criticism. Acetylene is a gaseous compound of carbon and hydrogen, first discovered, I believe, some years ago, by Edmund Davy, but examined with care only about four years since, by Berthelot. Davy and Berthelot both found it in ordinary coal gas, but in very minute quantity, and the latter, although he discovered several new sources of it, expressly says that "the difficulty of preparing it in sufficient quantity has prevented him from studying its compounds in detail." He says that it has a very disagreeable odor, and that it is soluble in water, both of which properties would render it a highly objectionable ingredient of lighting gas, especially the latter property, which would entail its condensation in the condensers, holders, and meters. Berthelot states, moreover, that it burns with a luminous but *highly smoky* flame, as was to be expected, from the fact that its per centage composition of carbon and hydrogen is identical with that of benzole, whose vapor burns so smokily, unless very largely diluted with other gases. Its content of carbon is nearly seven per cent. larger than that of olefiant gas. Its specific gravity is 0.92. It appears very improbable that Dr. Elmer's gas contains more than a very small proportion, if any, of this rare product, acetylene.* If the assertion of its presence in important quantity rest upon any *analytical* evidence at all, it may be that the vapor of benzole or some other hydrocarbon having the same composition, has been mistaken for it. I should not omit to remark, in addition, that acetylene is known to form with metals *explosive compounds*, and powerful explosions sometimes occurred in former days, when gas tubes made of *copper* were occasionally employed, arising from its combination with the copper.

Professor Wurtz inserts at this place the following important historical note:

"The first chemist who observed the explosive compounds formed by the combination of the acetylene, which always occurs in traces in ordinary gas, with the internal surface of copper tubes, was, so far as I can ascertain, Dr. JOHN TORREY, of New York, the observation having been made as early as 1839. Acetylene was then, of course, unknown, but Dr. Torrey, on first reading the accounts of Boettger's discovery of the explosive compound precipitated from alkaline solutions of cuprous oxyd by coal gas (Dingler's Polyt. Journal, 52, 22) afterwards found by Berthelot to be a compound of acetylene with the cuprous oxyd, recalled his previous investigations and published an interesting note on the subject in the *American Gas-Light Journal*, of September 1, 1859. I clearly remember being informed of these facts myself, by Dr. Torrey, in the year 1849, and he at the same time stated to me that he believed, from his experiments on the explosive material, that it was a very unstable compound of some unknown hydrocarbon with the copper, a hypothesis since remarkably verified.—H. W."

In the above extracts will be found several inconsistent statements. Thus Dr. Elmer's belief that his gas is a chemical compound, and does not change by keeping, does not agree with his repeated statement that it contains olefiant gas, marsh gas, and acetylene—the latter being, as we have seen, soluble in water; so that, if present, its absorption by the water of the gas holder would certainly cause a deterioration similar to that which he attributes to ordinary gas. Again, he says, "the new gas is free from the noxious substances always present in ordinary gas," referring, it is to be inferred, to sulpher compounds, &c.; although he uses in making his gas the same materials, containing sulphur, as are used for making ordinary gas, such as coal, coal tar, crude petroleum, &c. Mr. Charles Hastings says expressly that "the water bath washes out the volatile hydrocarbons," and that the gas "is purified by dry lime and carbonate of iron, which take up the ammoniacal salts and sulphur."

The assertions made as to the enormous gain, both qualitative and quantitative, attained by the new method, recall the similar extraordinary accounts on record of the water gas of Selligue, published from 1834 to 1840. Many of the most eminent French chemists experimented upon Selligue's plans and products, and obtained results of so remarkable a character, and reported so strongly in favor of the new plan, that the greatest public interest was created, and apparatus erected extensively for manufacturing Selligue's gas. Among these chemists are mentioned the great names of Thénard, Dumas, D'Arcet, Payen, and Peligot. As regards the *quantity* of gaseous product, Selligue's results far surpassed those of Dr. Elmer, since the latter states that he obtained from four lbs. crude petroleum and four lbs. oil of tar but 135 feet of gas, or 17 feet per pound of oil; while it is recorded of Selligue that he obtained from one pound of "oil of schist" no less than 86 feet of gas, of 0.65 specific gravity, and of twice the illuminating power of ordinary gas. Peligot's analysis of this gas gave, in 100 parts, 28 of carbonic oxyd, 15 of hydrogen, and 56 of different kinds of hydrocarbon compounds.

If, therefore, at this late day, we are to return to any plan of making water gas, and abandon our present methods, it would seem that we already "know a trick worth two" of Dr. Elmer's; for it is manifestly better to get from one pound of material 86 feet of double power, than only 17 feet, though the latter be of quadruple power. The difference in favor of Selligue is as 172 to 68. But, unfortunately, these statements about Selligue's gas do not "hold water;" the numbers involving several inconsistencies so great as to render them incredible. For instance, the carbonic oxyd and hydrogen, derived from the water and charcoal, make up together, by Peligot's anlysis—the accuracy of which cannot be questioned—but 43 per cent. of the 86 cubic feet of gas from one pound of oil. Now, 43 per cent. of 86 is 37. Therefore (86—37—) 49 cubic feet of the gas must have been derived from one pound of oil. But 49 feet of gas of specific gravity 0.56 weighs, according to my calculation, about two pounds two ounces; that is, more than twice the weight of the oil from which it is derived. This mode of viewing the subject seems, to speak within bounds, to involve Selligue's results somewhat in obscurity.

The pamphlet gives also some remarkable statements of results of two experiments with cannel coal, which furnish us means for the application, as in the case of Selligue, of a little *arithmetic*. In the first experiment was used 89 lbs. coal and 12½ lbs. zinc, and produced 75 lbs. coke and 623 feet of gas of treble the value of the street gas; and in the second, used 83 lbs. coal and 10 lbs. additional of zinc, produced 560 feet of gas even better still than before, with 60 lbs. coke—the weight of zinc left unconverted into oxyd in both experiments togther having been 12½ lbs. In making our calculations we shall have to guess at the specific gravity of Dr. Elmer's gas, which, if it has the very highly carburetted character he attributes to it, should be very high; but in consequence of the probability above indicated of the incorrectness of Dr. Elmer's hypothesis of the synthetical conversion of hydrogen into the heavy gas acetylene (whose specific gravity is 0.92), and the probability, therefore, that his gas may contain even a greater proportion of the very light gas hydrogen than Selligue's, let us assume for it the specific gravity 0.5—considerably less than that found for Selligue's—and let us see how much the gas produced in these two experiments (1,183 feet) weighed altogether. I make this 45 lbs. 5 oz., nearly. This is very remarkable, in view of the fact that the whole amount of volatile matter obtained from the 172 lbs. of coal used, obtained by deducting the coke (135 lbs.) was but 37 lbs. Whence came, then, the other 8 lbs. 5 oz. of ponderable matter contained in the gas? It could not have been hydrogen derived from the decomposition of the steam by the zinc, for the whole amount of zinc oxydized in both experiments is stated to have been, by actual weighing, but 10 lbs., which is equivalent to but one-third of a pound, or say the odd 5 oz. of hydrogen, leaving *eight pounds* of gas to be accounted for, the origin of which is involved in a darkness which no degree of "illuminating power" on its own part will dispel.

Had we assumed a number for the specific gravity more in accordance with the asserted highly carbonaceous character and high illuminating power of the gas, our *reductio ad absurdum* would have been still more conclusive; and in order to reconcile the figures with each other, we have to assume for this gas the very low density 0.4, which is rather inconsistent with the name *acetylene*, conferred upon it by the inventor.

Moreover, if we take the first of the above experiments by itself, we involve ourselves in quantities still more paradoxical. The 623 feet of gas there produced, if of 0.5 density, weighed 23.85 lbs., while the whole volatile matter from the coal was but 14 lbs., leaving 10 lbs. of gas unaccounted for; and in order to eliminate the inconsistency from these numbers we must attribute to the new "acetylene gas" a density of but 0.31, about half that obtained from cannel coal in the ordinary way. It is proper to add that, in the above calculations no allowance whatever is made for the large loss of weight which invariably occurs in the distillation of coal, arising from the conversion of portions of its volatile matter into carbonic acid, water, ammonia, bisulphid of carbon, sulphuretted hydrogen, prussic acid, and other condensible substances, *the whole* of the volatilized portion of the coal being supposed to have passed into gas. Had such allowance been made, our difficulties would have been enhanced.

There is one assumption possible, which would at least partially explain away the difficulties we have met with in the analysis of Dr. Elmer's results, and this is that the error may have been committed, when the volume of his gas was taken, of not allowing sufficient *time for it to cool* before hand. If measured hot, the volume found would be very much too great. If then, after the gas had been measured, and transferred to the holder, its illuminating power were determined, sufficient time would, in the interim, have elaspsed for it to have cooled and condensed into its normal volume under the atmospheric pressure. It is undeniable that, by peculiar management of the heat, and other conditions, and particularly by only saving the portions of the gas which first come over, exceedingly rich gas may be obtained; but what was gained in quality would be lost in quantity, unless, indeed, the quantity should be measured just as the gas escapes from the retort, before it has cooled and condensed into its normal volume.

It is clear, from this discussion of Dr. Elmer's publication, that much more precise and detailed informa-

* In a subsequent note it is stated, that this conclusion was verified by Mr. Schultz, by passing Dr. Elmer's gas for ten minutes through "an ammoniacal solution of cuprous chlorid," and that "no indication of acetylene appeared."

tion must be furnished the public, regarding his plans, before they will receive much serious consideration from an important class of the public, namely, those who possess some knowledge and understanding of the subject of gas. HENRY WURTZ."

A note is appended stating, among other matters, that on a personal interview with Dr. Elmer, an idea of the internal structure of his apparatus was arrived at differing materially from that derived from the description given by Mr. Hastings in the pamphlet, and we may quote further as follows:

"Dr. Elmer states that the passages from the "carbon retorts" into the zinc retort are so large and so short, that the space above the surface of the fused zinc in the latter forms merely an extension, as it were, of the space in the coal retorts not occupied by the coal itself; in other words, that the atmosphere enveloping the solid materials operated on, was in all three of the retorts practically homogeneous."

Professor Wurtz considers it proper to remark, also, that "Dr. Elmer does not pretend to controvert the several *non-sequiturs* pointed out in the above review, and attributes the discrepancies in the numerical results of the experiments to his own absence at the time of publication of the pamphlet, which therefore could not receive his personal supervision. In fact, he states that the publication was made by parties interested in his new project, for distribution among members of Congress at Washington, without any previous consultation with him."

WATER.

WATER WORKS AT CHICAGO.

We take the following from the Annual Report of the Board of Public Works:

OFFICE OF THE BOARD OF PUBLIC WORKS,
Chicago, April 1, 1864.

To the Mayor and Aldermen of the City of Chicago, in Common Council assembled:

The Board of Public Works respectfully submit herewith their annual report for the fiscal year ending March 31st, 1864.

INCOME.

The total revenue derived during the year amounts, from water taxes, to	$19,841 99
And from profits tapping pipes, to	1,404 40
Total	$192,246 39
Increase in the amount of water taxes over the receipts of the same for the year previous	$23,090 77

The Board have continued to add to their number of water meters in use, and with increasingly satisfactory results. It is now a rule with the Board to determine by meters the charge for water for all large consumers. The water tax ascertained by meters, during the last fiscal year, amounts to $23,516.

EXPENSES AND REPAIRS.

The expenses of the last fiscal year were as follows, viz.:

Interest on Water Loan Bonds	$72,033 10
Expenses at the pumping works	24,619 96
Miscellaneous repairs, including work on new inlet, and water meter repairs and expenses	10,157 30
Miscellaneous operating expenses, including salaries and office expenses	22,496 50
Total, interest, expenses and repairs	$129,206 86

COST OF ADDITIONS TO THE WORKS DURING THE YEAR.

Besides the foregoing, there was expended during the year:

For laying about 13 miles of water pipes	$75,241 29
For otherwise extending the works, not including lake tunnel	1,913 35
For Lake Tunnel—surveys, borings, drawings, &c.	2,919 62
Total cost of extending works during year,	$80,074 26

PRESENT COST OF WATER WORKS AND HOW PAID FOR.

Cost of the Water Works, April 1st, 1864, including Lake Tunnel	$1,198,569 23
The means by which the works have been derived as follows, viz.:	
Six per cent. bonds outstanding, $1,030,000, less $79,384 09 for discount, (the bonds having generally been sold at their seven per cent. par value,)	$950,615 91
Seven per cent. bonds outstanding	103,000 00
Balance derived from water rents	144,053 32
	$1,198,569 23

The Board have not found it necessary to issue any bonds since 1861. The income of the works is sufficient to provide for any ordinary enlargement, such as extending the distributing mains, besides paying the interest and expenses.

WATER PIPES LAID.

There have been laid during the year 13 miles and 51 feet of 4, 6 and 8 inch distributing mains, and in the three divisions of the city, as follows, viz.:

South Division	14286 feet.
West Division	43,082 "
North Division	11,323 "

Total length of water pipes laid during the year, 68,691 feet, or 13 miles and 51 feet.

There are now laid in the city six miles and 2,247 feet of supply mains, and 111 miles and 2,694 feet of distributing mains. Total amount laid of water pipes of all sizes 117 miles and 4,942 feet.

Notwithstanding the amount of water pipes laid during the year was large, as stated above, it still fell considerably short of the amount which the Board were urged to lay, by applications from all parts of the city. The Board have now before them petitions for supplying streets with water, many of them, too, in pressing need of it, to supply which will require as much as ten miles of pipes; and we are constantly receiving additional petitions. There remain to be delivered, of last year's contract, 110 tons of pipe, and we have ordered a further supply of 400 tons, to be delivered soon after the opening of navigation, which, altogether, will provide for some seven miles of the streets to be supplied. The present cost of the iron, and of the labor and materials generally to be applied in laying the pipes, is, however, so excessive, that an amount of water tax which would warrant, in ordinary times, the putting down of the pipes in a street, will not now pay half the interest on the cost of the pipes and the current expenses. To avoid entailing a heavy, unproductive debt on the Water Works, the Board are compelled to limit the laying of the pipes to such places as are in most urgent need of the water, and where, also, the buildings needing water are most numerous and will yield the greatest amount of water tax. The more than usual demand for the water pipes is one of the consequences of the marked growth of the city during the year.

The Board will, early in the season, invite bids for 500 tons more of pipes, but even with this addition it will be impossible to extend the pipes to many localities for which a supply of water is asked.

LAKE TUNNEL.

The most important event connected with the Water Works, and making a part of their history for the year, is the commencement of work on the tunnel, to be extended out under the bed of Lake Michigan two miles, so that the water will be drawn from the lake that distance from the shore. This project was fully set forth in our last report, and was finally adopted by the Board early last year, as that promising to secure most certainly, and with least expense to the city, its supply of water from a point in the lake where it will not be affected by the discharge from the river, or other impurities from the lake shore.

During the summer, examinations were made along the whole line of the contemplated work, by boring, at short intervals, to the depth proposed for the tunnel, to ascertain the character of the material through which it would pass, and various observations were made to test the quality of the water at the proposed outer end and inlet for the tunnel, and to ascertain also the distance from the shore to which the water of the river reached after certain most marked discharges of the river into the lake. From the borings it was found that the material through which the tunnel would be built was uniformly clay, and apparently of a firm and even character; and the observations concerning the effect of the river on the lake, showed that, even when most marked, no trace of its influence could be detected much more than a mile and a quarter from the shore. The information obtained on these and various other points, satisfied the Board that the tunnel would accomplish the result sought for, and that the work was entirely practicable. The necessary drawings and specifications were prepared as speedily as practicable, and advertisements were issued in New York and Boston, as well as here, inviting proposals for the doing of the work. The bids were received and opened September 9th, 1863, most of the parties submitting proposals being present at the opening.

The bid of Messrs. Dull & Gowen, of Harrisburg, Pa., being unconditional, and for the whole work, was accepted by the Board the day after the reception of the proposals, as the lowest and best bid. Soon after its acceptance, the Board made report of their doings to the Common Council, and requested to be authorized to proceed with the work, and to issue bonds to provide for its cost. The Council granted this desired authority by ordinance of October 5th, 1863.

Subsequently to the execution of the contract, the Board decided to change the manner of constructing the land shaft, which was originally designed to be wholly of brick, and is so described in the specifications. The change consisted in substituting three cast iron cylinders, each ten feet long, essentially like the iron cylinders proposed for the outer lake shaft, in place of the brickwork of the upper thirty feet of the shaft. This was done to facilitate the sinking of the shaft through the bed of quicksands overlying the clay, the distance through the quicksands to the clay being about twenty-four feet.

The formal breaking of ground took place March 17th last, and the work has been in progress since that time, with occasional interruptions. As was anticipated, a good deal of difficulty has been experienced by the contractors in working through the water and quicksands, but the difficulty has been much less with the iron cylinders than it would have been with brick work, and the clay having been reached, we may reasonably hope that we shall not have serious trouble from this cause hereafter. Of course the work is not sufficiently advanced to enable the Board to form a conclusion as to what rate of progress may be looked for. The time fixed in the contract for the completion of the work, is November 1st, 1865.

Besides the change in the manner of constructing the land shaft, the Board have agreed with Messrs. Dull & Gowen to make certain changes in the outer crib, so that the crib will be stronger than as originally proposed, and so that solid masonry can be eventually substituted for the mass of loose stones with which the crib will be filled.

The State legislature had previously given the necessary authority for placing in Lake Michigan any piers to be found necessary for constructing and maintaining the tunnel, but to avoid any question as to the right of the State to make such a grant, the sanction of the United States to the act of the State legislature was obtained, by act of Congress, passed January 16th, 1864.

LOCATION AND GENERAL DESCRIPTION OF THE TUNNEL.

The tunnel is to commence at such point as may be selected by the Board of Public Works, on the lot now occupied by the pumping works of the city of Chicago, at the east end of Chicago avenue, and on the shore of Lake Michigan: and to extend two miles out under the lake, in a straight line, at right angles to the general direction of the shore.

The bottom of the inside surface of the east end of the tunnel shall be sixty-six feet below the ordinary

level of the lake, or sixty-four feet below what is usually known as "City Datum;" and the bottom surface shall descend uniformly at the rate of two feet per mile to the west end of the tunnel.

There are to be one land and two to four lake shafts; the land shaft at the west end, one lake shaft at the east end, and the remaining lake shaft or shafts at such intermediate points as shall be determined upon by said Board, when the proper time for locating them shall arrive. The lake shafts are to consist of cast iron cylinders, and to be protected by hollow ,pentagonal cribs.

The tunnel is to be very nearly circular in form, and to have an interior width of five feet, and height of five feet and two inches.

DESCRIPTION OF THE CRIBS.

The cribs are to be five-sided, each outer side to be fifty-eight feet long. There is to be a central space in each crib, in form similar to the outside, leaving the thickness between the central space and outside of the crib twenty-five feet. The interior and exterior sides of the cribs are to be perpendicular from their bottoms to their tops, which are to be five feet above the ordinary surface of the lake; hence, the outermost crib is to be forty feet high. The height of the others will depend upon their location, which will be determined during the progress of the work.

The outer crib is to have three openings through its sides, one opening through each of the western and southern sides; each opening to be five feet high and four feet wide, and to be connected with the top of the crib by a well four feet square. The most northern opening is to have its bottom five feet above the bottom of the crib, the middle one eleven feet higher, and the southern one eleven feet higher than the middle. Each opening is to be furnished with an iron paddle gate, to be worked by means of an iron rod, from the top of the crib, as shown on plans No. 9 and ten.

Each crib is to be provided with two gates, each two feet high, and one and a half feet wide, placed five feet above the bottom of the crib, and against the wall of the inside space. These gates to be used for regulating the sinking of the cribs to their places, and worked by rods from the top of the crib, as shown on plans No. 11 and 12. Wrought iron gratings to protect these grates must be provided as shown on these plans.

PUMPING WORKS.

It is evident that it will soon be necessary to increase the pumping power of the works. With the view of making timely preparation for this want, the engineer of the pumping works, Mr. D. C. Cregier, under instructions from the Board, visited last winter all the principal water works of the country where artificial power is used for the elevation of the water, and inspected their machinery.

REPORT OF ENGINEER OF PUMPING WORKS.

Engine House Pumping Works,
Chicago, April 1, 1864.

E. S. CHESBROUGH, Esq., City Engineer:

Sir,—Agreeable to the usual custom, I herewith present a statement of the operations of this department for the year ending March 31st, 1864.

On the 24th of November last the water was shut off for the purpose of cleaning the pump well, which occupied about three hours. During this time the reservoirs were full of water, and watchmen were stationed at each for the purpose of opening the gates in the event of a fire occurring in the city. With this exception, the supply of water to the city has been constant throughout the past year.

The quantity pumped during the year just closed amounts to 2,336,108,454 U. S. gallons, and exceeds the quantity pumped the previous year 118,828,715 gallons.

Of the whole amount delivered, the

Large engine pumped	1,177,627,536	gals.
Small " "	1,158,480,918	"
Being an average daily quantity of,	6,382,810	"

ANALYSES OF LAKE SUPERIOR, MICHIGAN, AND SOUTH MOUNTAIN, PENNSYLVANIA, IRON ORES.

The *U. S. R. R. and Mining Journal*, of August 6th, says:

We have been favored, by a personal friend, with a pamphlet containing reports on the St. Mary's Canal Mineral Land Company's ore and wood lands, located in the iron region of Lake Superior, county of Marquette, Michigan, by Henry D'Aligny, Mining Engineer, Resident Agent.

The report bears date "January, 1864;" since which time the lands have been sold to parties identified with the Peninsula Railroad, which terminates on Little Bay de Noquet, thus opening an outlet from the Marquette iron region to Lake Michigan.

Mr. D'Aligny's pamphlet abounds with interesting facts, analyses and tabulations.

We copy below, Joseph C. Kent's analyses of eight ores furnished him from specimens taken during explorations made on several sections of land belonging to the St. Mary's Mineral Land Company. Mr. Kent is Superintendent of the Cooper Anthracite Blast Furnaces on the New Jersey side of the Delaware river, a short mile south of the mouth of the Lehigh river:

OFFICE COOPER IRON WORKS,
April 1, 1864.

S. J. TILDEN, Esq.: Dear Sir,—I have made assays and examinations of ore specimens Nos. 1, 2, and 3.

No. 1 is a remarkably pure hematite. It gave me 60.05 per cent. metallic iron; is free from sulphides and sulphates; contains a small percentage of manganese; would work well in the furnace, and make excellent iron.

Nos. 2 and 3 together gave 54.285 per cent. metallic ore; are free from sulphur, and contain magnese in minute quantity. They are the same in general character, but not quite so rich as No. 1. We call the ore good when it yields forty-five per cent.; your specimens are very rich.

I enclose the assays, and will send you the results obtained from remaining specimens as fast as I can obtain time to make the examinations.

Respectfully yours, JOS. C. KENT.

OFFICE COOPER IRON WORKS,
April 11, 1864.

S. J. TILDEN, Esq.: Dear Sir,—Specimen No. 4 contains—35 per cent. oxide iron,
38 per cent. oxide manganese,
15 per cent. silica.
Balance water and loss.

This ore would be of no use to work alone in a furnace, but would be a valuable material to work with the red oxides,—the quality of the iron from which would be benefitted by the mixture.

Respectfully yours, JOS. C. KENT.

OFFICE COOPER IRON WORKS,
April 15, 1864.

S. J. TILDEN, Esq.: Dear Sir,—Specimen No. 5 is a very superior *red oxide*. It yields sixty-three per cent. metallic iron, and contains sufficient manganese to make it work well in the furnace and produce good iron. It is a very close-grained ore, and has a steely fracture, similar to some of our old Andover ore. I have always found that ore of this character made the best of iron.

Respectfully yours, JOS. C. KENT.

OFFICE COOPER IRON WORKS,
April 18, 1864.

S. J. TILDEN, Esq.: Dear Sir,—Specimen No. 6 is a micacious red oxide yielding 57.14 per cent. metallic iron, and a small quantity of manganese—a valuable ore for the furnace, and one that will make good iron.

Respectfully yours, JOS. C. KENT.

OFFICE COOPER IRON WORKS,
April 22, 1864.

SAML. J. TILDEN, Esq.: Dear Sir,—Specimen No. 7 is a silicious red oxide, and yields 47.15 per cent. metallic iron.

No. 3 is also a red oxide, containing 51.42 per cent. metallic iron, and is also silicious. I find no manganese in either of the above specimens, but they are ores that would work well in a blast-furnace. The series of eight ores would prove very valuable for working ores in the blast-furnace.

Respectfully yours, J. C. KENT.

As interesting in geographic and historic comparison, we append an analysis of Pennsylvania brown hematite iron ore, taken from the estate of the South Mountain Iron Company, situated about fourteen miles southwest from Carlisle, and about thirty miles from Harrisburg. The estate of the South Mountain Iron Company (ore and wood lands), comprises about thirty square miles of territory, most of which is in Cumberland county.

CHEMICAL LABORATORY AND ASSAY OFFICE,
No. 138 Walnut street, Phila., April 20th, 1864.

We have analysed the specimen of brown hematite procured by Mr. P. Williams on the estate of Wm. M. Watts, Esq., (now the property of the South Mountain Iron Company,) in accordance with your request, and find in the ore, dried at 212° Fahrenheit, as follows:

Per oxide of iron	78.78
Per oxide of manganese	8.50
Silica	2.20
Water and loss	11.52
	100.00

77.78 per cent. of per oxide of iron is equivalent to 54.47 per cent. of iron.

The accompanying specimen of limestone, used as a flux, contains 2.34 per cent. of iron.

Respectfully yours, &c.,
DU BOIS & WILLIAMS,
Analytical Chemists.

It will be observed that Mr. Kent says: "We call the ore good when it yields 45 per cent."

It will be noted, too, that the South Mountain Pennsylvania specimen yielded richer than five of the eight Lake Superior specimens analysed by Mr. Kent; also, more than the average yield of his "series of eight ores."

QUINCY COPPER MINING COMPANY OF PORTAGE LAKE, MICHIGAN.—"Office of Quincy Mining Company, No. 51 Exchange-place, New York, July 30, 1864. *Dividend.*—The Board of Directors have declared a dividend of eight dollars per share from the earnings of the past six months, payable on and after Monday, the 15th of August next. Massachusetts holders will be paid at the office of T. Henry Perkins, No. 19, State street, Boston, until September 1. The transfer books to be closed from August 5 to 15th inclusive."

W. HART SMITH, Sec'y.

Out of the earnings of 1863 the Quincy Mining Company paid two dividends of six dollars per share of stock, making twelve dollars per share of stock for the year, which, as the par of the stock is $25 (it sells for $102 per share) is equal to forty-eight per cent.

The dividend of eight dollars per share, payable 15th instaut, out of the profits of the six months ending June 30, 1864, is equal to sixty-four per cent. on the par of the shares ($25), for said half-year.

Last week we gave the half-year exhibit of the Pewabic Mining Company, showing that seven dollars per share were paid out of the profits of the first half of the present year—a dividend equal to fifty-six per cent. on he par of Pewabic shares ($25) for said six months.

And as the Quincy and Pewabic mines are on the identical copper bearing lodes crossed by the Dorchester location, Dorchester share holders have only to wait the lapse of sufficient time for their officers and employees to develope the metallic riches of their estate, on which two shafts are going down, to enjoy corresponding dividends.—*U. S. R. R. and Mining Register, August* 6.

The yield of gold in Australia and New Zealand for 1863, is near $40,000,000.

THE AMERICAN GAS-LIGHT JOURNAL AND MINING REPORTER is published on the 1st and 15th of every month, and is a recognized official organ of—

LIGHT, HEAT, MINING INTERESTS.

PETROLEUM, WATER-SUPPLY, AND SCIENTIFIC SUBJECTS GENERALLY.

JAMES W. BRYANT, EDITOR AND PROPRIETOR.

W. S. SHERMAN, PUBLISHER.

PROF. C. ELTON BUCK, CONSULTING CHEMIST.

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AND
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PUBLISHED ON 2D AND 16TH OF EVERY MONTH.

JAMES W. BRYANT, ... EDITOR.

TUESDAY, AUG. 16, 1864.

BACK NUMBERS WANTED.—We want to complete our files of the Journal, the following numbers, for which we are willing to pay full price.

Vol. II—No.'s 13, 22, 24, 25, 29 and 34.
Vol. III—No.'s 40, 42, 44, 47, 48, 52 and 56.
Vol. IV—No.'s 63, 64, 67, 68, 69, 70, 72, 74, 80, 82, 83.
Vol. V.—No.'s 91, 93, 95 and 96.

Those of our subscribers who do not bind the Journal, would do us an especial favor by forwarding to us any of the above numbers. We are being constantly called upon to furnish back issues of our paper by those who value it for future reference, and we have supplied them until all of the above numbers are exhausted.

NOTICE.—We advise our subscribers to preserve their copies of the JOURNAL with care, if they intend to have them bound at the conclusion of the volume, because our new subscribers are so numerous, who commence with the year, that we shall not have any back numbers to supply deficiencies after a short time.

NEW HAMPSHIRE SILVER-LEAD COMPANY.

We have received a preliminary report made for this new company, now being organized, made by Professor Wurtz, upon their property in the town of Lyman, Grafton county, New Hampshire. We propose to publish an abstract of this report in a future issue, but some of the facts developed are of such interest that we shall briefly glance at them now. There are numerous viens of quartz, carrying metals on the property. One of these is reported as at least *ten feet* wide, and bearing among other minerals a silver-lead ore, which assays from *thirty-six* to *fifty-six ounces of silver* to the ton. The estimated value of the metals in a ton of these ores, when free from veinstone, being, at present quotations, from $400 to $475 per ton. These galenas are said to be among the richest that have yet been found in the United States. The most interesting and important result obtained, however, was in the case of another narrower vein, the galena of which gave, besides *fifty-one* ounces of silver, about $50 worth of *gold* per ton, making the total value of metals in this ore about $500 per ton. This is believed to be the first example of the discovery of gold in galena in the State of New Hampshire.

OIL WELLS have lately been discovered near Visalia. The flow is said to be very large, and in a crude state. It burns brilliantly as refined oil.

THE INVENTIVE GENIUS OF THE UNITED STATES.

The heart of an American must throb with pride when he looks back where the world stood eighty-four years ago, and compares what has been done by the progressive and inventive spirit that was inaugurated when the doctrine that man was capable of self-government was first spoken into existence from the shores of America. The tocsin that sounded those great truths, found the people of the old world bound, hand and foot, and chained to a rock. It struck from the limbs of the toiling millions the manacles that had rusted for ages, cramping intellect, mind and genius, and loosened the fetters that had held all these God given qualities subservient to titled oligarchies, and star and garter orders—it taught man that mind was above matter, and that he was equal and co-equal with the proudest of earth. To what great height of human perfection has these teachings brought us? When the American government was first formed, there was on record in the whole archives of the world, which had stood for two thousand ages, not more than one thousand inventions that had sprung from the mind of man, so hampered had it been by the reigning and ruling despots of earth. But mark the progress that has been made by the American people since that great event. Upon the records of the Patent office in Washington, there now stands upwards of 60,000 inventions, most of which has tended to the advancement of either Science, Art, Mechanics, Manufactures, Agriculture, or human happiness. History, neither ancient nor modern, does not furnish a parallel to such rapid progress in none of the great objects of life. We might point to scores of perfected inventions that are astounding in their grandeur of conception, but the one most patent, and with which all are familiar, is steam. Carry the mind back to the days when Fulton first tried his experiment in American waters, and who was ridiculed as a maniac, and a visionary imbecile. Over the waters of the same noble river, up which the "Clare mont" slowly struggled for existence, and to force her way, as if endowed with life and reason, and interested in the man who was solving the greatest problem of the age—testing the hopes of years, and the ambition of his whole life, conscious of inaugurating a new era in the world's history, now majestically glides the most magnificent palatial floating hotels, propelled by the irresistible power of the strength of thousands of horses, steming the most rapid currents, and with the regularity of the sun, transporting cities of life and warehouses of merchandise. And still Progress is the spirit of the age, for even now the insidious element of Electricity is being applied as a motive power, and may some day not very remote, outstrip even the wonderful achievements of steam. By its great power we speak from continent to continent, and space becomes annihilated, and who can say that it will not yet become the greatest and most useful agent ever known. Already we find the principle being illustrated, in combination with Gas, in the "Lenoir Gas Engine." The inventive genius of the times has grasped the idea, its development will be sure to follow.

INCORPORATED.—The California State Mining Company have filed their certificate of incorporation. Their object is to quarry slate in Amador county. The capital stock is fixed at $270,000, divivided into 2,700 shares of $100 each. The Trustees are A. W. Henderson, Richard Williams and J. J. Lyons.

DR. WM. PRESCOTT, of Concord, New Hampshire, has recently given to Allegheny College, Meadville, Pennsylvania, one of the finest, geological, mineralogical and conchological cabinets in the country.

SCIENTIFIC INTELLIGENCE,

Prepared for this Journal by Prof'r. HENRY WURTZ.

THE NEW METAL CAESIUM.

This new element, discovered a few years since by Bunsen and Kirckhoff, by spectral analysis, has hitherto been obtained but in small quantity. Boettger announces, however, in a letter to Roscoe, that he finds much caesium in the salt obtained by evaporating the mineral water of Nauheim, near Frankfort. A hundred weight of this salt gives one pound of the double chlorid of platinum and caesium, with small quantities of rubidium and thallium. In Nauheim this salt can be bought for one thaler (about 75 cents, in specie,) per hundred weight. So that in future there should be no great difficulty in obtaining enough for thorough investigation. In spectral analysis Boettger prefers a flame of pure hydrogen to a Bunsen burner, on account of its higher heat. He has found thallium, not only in many mineral waters, but also in the vegetable king dom in very minute quantity, for instance in the ashes of wine, molasses, tobacco, and chicory.

Another curious announcement regarding this metal, caesium, is made by Pisani, who has re-analyzed one of a *constellation* of minerals which was whimsically created by Breithaupt from specimens found in the island of Elba, under the names of "castor and pullux." One of these *gemini*, pollux, was first analyzed by Plattner, caesia being then, of course, *terra incognita*, and 27 per cent. of mixed alkalies found, reported by him as potash and soda, with a little lithia. Pisani reports, from his new analysis, instead of these, not less than 34 per cent. of the new alkali caesia! Prof. S. W. Johnson, of New Haven, has also recently discovered caesia as a comparatively abundant constituent of some American mineral formations, and has extracted it in sufficient quantity to enable him to determine its chemical equivalent accurately, thus correcting an error of not less than five units in the earlier determination of this equivalent. Caesium thus furnishes another to the increasing list of examples of the diffusion far and wide of certain elements formerly regarded only of local occurrence, and, in the words applied by Jonathan Oldbuck to Dousterswivel's coins., "*rari—et rarior—etiam rarissimi!*"

With regard to the name "caesium," a query has occurred to me, which I cannot refrain from presenting. It is said to be derived from the *sky blue* lines in its spectrum. Unless my Lexicon fails me, however, the proper word would seem to be *caeruleum*, the adjective *caesius* having been applied to designate the color of a *gray* or cloudy sky; unless, indeed, we choose to believe that Lucretius, be *caesia puella*, instead of a girl with gray eyes (like those of a cat), meant something like what we call a "blue stocking"; and that the *caesius leo* of Catullus shows that remarkable zoological species exemplified by the "Blue Lion at Muggleton," renowned through the Posthumous Papers of the Pickwick Club, not to be, as heretofore supposed, exclusively of modern origin.

THE STILL NEWER METAL—INDIUM.

The spectroscope has recently developed to us, in the hands of Reich and Richter, of Freiberg, another new metal, whose atoms, like those of caesium, radiate blue rays when in the condition of flame. It is a constituent, in minute quantity, of the black zinc blende ore of the Himmelfahrt Mine, and somewhat resembles cadmium in its chemical relations, its precipitated sulphid having a beautiful yellow color, but it differs from cadmium in being precipitated by sulphohydric acid, only from its solutions in weak acids, like acetic acid. It is soft, malleable, ductile, of the color of cadmium or tin, and forms a yellow oxyd. Some of our spectroscopists should examine our immense formations of dark-colored blende, such as those at Wurtzboro', New York; Eaton, New Hampshire, and elsewhere, for indium. Dr. Jackson found two or three per cent. of *cadmium* in some of the New Hampshire blendes, and 0.6 per cent. in the brown blende of Eaton.

Mind you, a child is not a wooden top, that you can make come round, as you will, by whipping it.

We take the following from the London *Grocer*, of July: "The Trinidad Petroleum Company intends to apply a subscribed capital of £150,000 to the development of the oil-producing regions in Trinidad. It is estimated that eight thousand tuns of oil may be imported during the first year at a cost of less than £7 per tun, and from calculations which have been carefully prepared and revised by leading houses, with a liberal addition to all the charges, it is shown that the profit upon the operations of the company will be at the rate of not less than 25 per cent. per annum on the capital. Messrs. Goddard, Finch, and Company, and Messrs. George Shand and Company, the well known refiners, report very favorably on the superior quality of the oil produced from Trinidad pitch. The first named firm, speaking of a particular sample, considers it the best sample of lubricating oil they have received, and offer to take 100 tuns at £22 per tun."

A first attempt was made to fish by electric light a short time since at Dunkirk. The light was supplied by a pile on Bunsen's principle, composed of about fifty elements, and it succeeded tolerably well, but the employment of the pile was attended with much inconvenience. It was then determined to repeat the attempt with a magneto-electric machine. The new experiments tried at Dunkirk and Ostend had a double object—1. To prove how the light produced by the machine would act under water. 2. To discover the effect the light would produce on the fish. The first object was completely accomplished, and it is now demonstrated that magneto-electric machines and the light they produce are applicable to all submarine works. In fact, this light was constant at 180 feet under water, and it extended over a large surface. The machine, nevertheless, was placed at a distance of more than 300 feet from the regulator of the electric light. The glass sides of the lantern remained perfectly transparent, and the quantity of coal consumed to drive the magneto-electric machine was less than if the light had been in the open air.

Where Ivory comes from.—An exchange says, maiciously: "You carry a beautiful cane—it cost $3 50—$1 50 extra on account of its beautiful pure ivory head. Your wife has a costly fan, with a pure ivory handle. In your pocket is a pure ivory-handled penknife, very pretty and fine. On your table is a set of knives and forks, with pure ivory handles, and a little expense they have cost for being pure ivory. The ring in which are the reins of your costly double harness is pure ivory. The handles of beautiful parasols are pure ivory—and so on, with many articles useful and ornamental. But it happens that this "pure ivory" is manufactured from the shin bones of the dead horses of the United States Army."

News for Fat People.—Fat people may now breathe more freely. Dr. Dupare, of London, assures the public that by using his remedy of Fucus Vesiculosus, they may become shapely and get rid of their superfluous flesh. His remedy is no more nor less than a seaweed used in the manufacture of kelp, and common on sea coasts; strange to say, however, this very Fucus is fed in the Scottish islands to horses, cattle, and sheep, to keep them in flesh during the winter months, and so also in Norway. This inclines us to doubt the pretensions of Dr. Dupare.

Singular Discovery.—A few days since a party of tin streamers at work on Goss Moor, in the parish of St. Dennis, discovered a layer of hazel nuts at a depth of twenty feet from the surface, and lying beneath four feet of ground that had been previously unbroken. The shells of the nuts, of which there were many thousands, were quite perfect, though black, but they contained no kernels.

The Coal Exports from all the coal ports of the United Kingdom of Great Britain to North America, from Janaary to June, inclusive, 1864, was 135,731 tons—to South America during same time, was 182,219. The total exports to all ports, was 3,794,841 tons. So says Laird's *Liverpool Coal Circular*.

PETROLEUM REVIEW—August 15th.

New York, Aug. 15, 1864.

Crude.—Has been remarkably steady since my last report—having only slowly advanced two cents above last quotations. The sales at the close are 1,000 bbls. 40° *a* 47° at 52½ cts.; 500 bbls. 40° *a* 45° at 53 cts.; 1,000 s. o. until the 15th of Sept. at 53½ cts. The market closed dull, but firm.

Refined.—The market in this has also been dull. Bonded sold at the close for 85 cts. for white; 1,000 bbls. light straw to white, at 83 cts.; 126 bbls. do. at 82½ cts.; 80 bbls. at 72 cts. old bond.

Free oil has been dull, but has forced itself up three or four cents since my last. I notice at the close of 300 bbls. prime white at 90 cts.; 100 do. same price; 500 prime light straw to white, 89 cts.; 150 bbls. light straw to white 87 cts. Straw sells, according to quality, at from 77 to 85 cts.

Benzole is dull at last quotations.

Remarks.—The general stagnation in the trade is owing in great measure to the steadiness of gold, and the difficulty of shipping bonded oil. Gold for the past month has fluctuated between 250 *a* 260, and exchange has been drooping. The new law, in regard to bonded oil, passed June 30, 1864, has such conditions in it that it is impossible to ship oil, and get the necessary papers to cancel bonds. The new law requires the manufacturer to give bonds for double the amount of the Government tax, and then to get a permit to ship to some seaboard city for exportation to Europe. In shipping here he has to send the oil to some bonded warehouse. The receipt from the warehouse cancelling the bonds of the manufacturer. And when the oil is shipped from here, the shipper has to give bonds, which a "landing certificate" only will cancel. The Government has not as yet bonded a single warehouse, and consequently for the past two weeks we have not been able to ship oil, made under the new law.

B. L. Harsell,
Commission Merchant,
132 & 134 Maiden Lane, N. Y.

Depth of the Sea.—Capt. Sir John Ross made some enormous soundings at sea, one of which, 900 miles west of St. Helena, extended to the depth of 5,000 fathoms, or 30,000 feet, or nearly 5¾ miles; the weight employed amounting to 450 pounds. Another, made 300 miles west of the Cape of Good Hope, occupied 49½ minutes, in which time 2,226 fathoms were sounded. Capt. Denham sounded in the South Atlantic, 7,706 fathoms, or nearly 7.6 geographical miles.

A large fire recently occurred in a petroleum establishment in Paris, and the police authorities have issued posters containing instructions to buyers and sellers of this inflammable article for the prevention of accidents in its use. The French generally seem to regard this article as something but little less dangerous than gunpowder, though they conquer their timidity and aversion to bad smells to the extent of using the oil in considerable quantities.

A Tun of Coal.—The U. S. Circuit Court at Philadelphia have decided that the weight of a ton of coal is 2,240 lbs. instead of 2000 lbs. The Judge ruled that a company of grocers might as well meet and agree to reduce the number of ounces in a pound and make the smaller number the standard of a pound for their customers, as for coal dealers to agree the weight of a ton shall be 2,000 lbs., and furnish that amount to their customers.

Peat.—A peat company is about to be formed in Rochester, to supply that city with fuel. It seems that the peat can be cut, dried and conveyed to the city at a much less cost than coal. Projects of a similar kind are starting in this neighborhood. Long Island and New Jersey, it is said, are likely to produce large quantities, and the method of drying the peat and preparing it for market has been patented. A substance is derived from the peat that resembles coal. —*Newark Journal.*

NEW YORK MINING EXCHANGE.

New York *August 15th*, 1864.

	Bid.	Asked		Bid.	Asked
Copper Stocks.			***Gold Stocks.***		
Aztec	7⅞	9	Benton	1	1¾
Bedford	1	1⅛	Consol'd Gregory	25	28⅞
Boston	4⅛	5⅜	Corydon	—	3
Caledonia, A. P.	10	12	Gunnel	3⅜	4⅛
Canada	3¾	4	Great Western	—	8
Carp Lake	3	5	Hope	—	9
Central	65	70	Isaac's Harbor	¾	⅞
Columbian	—	24	Manhattan	—	9
Copper Falls	34⅛	38	Mariposa	44	44¾
Clifton	—	$1	Montana	½	1
Dacotah	—	5½	New York	2⅛	3
Derby	⅞	1⅛	N. Y. & Nova Scotia	¾	1¼
Douglass	—	—	Quartz Hill	9¼	10
Evergreen	18¾	20	Quicksilver M'g Co	81	82
Flint Steel River	12	13⅛	Rocky Mountain	—	10⅛
Frue	2¾	5	Smith & Parmelee	7	12
Grand Portage	—	—	***Coal Stocks.***		
Hancock	12⅜	14	American	98	100
Hamilton	—	6	Ashburton	—	25
Hilton	5	6	Central	62	65
Hudson	1	2	Cumberland	61	62
Huron	32	33	Del. & Hud. Canal	206	208
Indiana	8¾	9¼	*Hampshire & Balt.	104	110
Isle Royale	20	20⅜	Pennsylvania	213	215
Keweenaw	—	6	***Lead Stocks.***		
Knowlton	7	10	Bucks County	⅝	⅞
Lafayette	1	2	Clute	1⅜	1⅝
Manhattan	—	—	Erie	—	20
Mendota	—	—	Macomb	3¾	5
Merrimac	4¾	5⅜	Placentia Bay	1⅜	1⅝
Minnesota	33	37	Sussex	¾	⅞
New York, A. P.	2	3⅛	Wallkill	3⅛	6
N. J. Consolidated	4	4¾	***Iron Stocks.***		
Norwich	—	6	Copake	8	10
Ogima	5	6¾	French Creek	⅜	1
Ontonagon	3	4⅛	Teal Lake	4⅜	6
Penn	—	11⅜	***Miscellaneous.***		
Providence	1⅜	2	Rutland Marble	17	20
Quincy	96⅜	98	* *Ex. div.*		
Reliance	1¼	2¼			
Rockland	12⅜	14			
Superior	8⅝	9			
Sharon Consolidated	—	3			

SALES.

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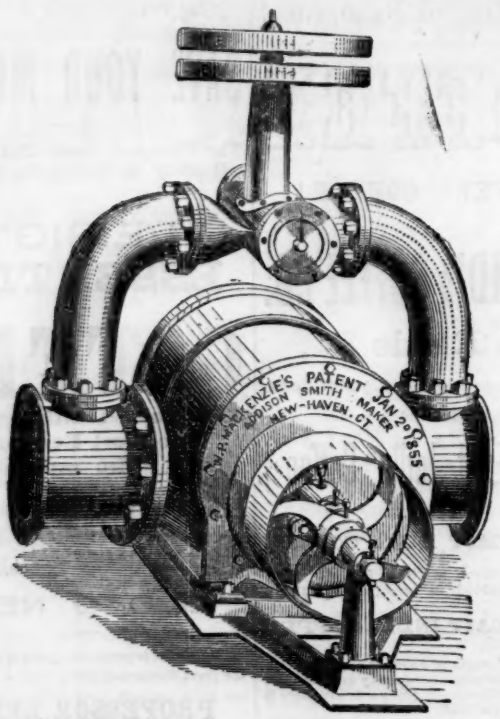

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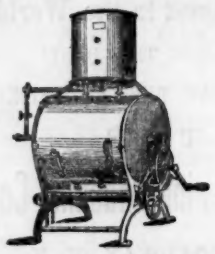
PATENT

AUTOMATIC GAS MACHINE.



THIS MACHINE, which has been in constant use for more than two years, is now acknowledged to be the

Most Convenient,
Simple, and
Efficient Method

OF LIGHTING BUILDINGS OF ALL KINDS, out of the reach of regular gas-works, ever brought to public notice.

The SIMPLICITY OF THE APPARATUS, its ENTIRE FREEDOM FROM DANGER, the LITTLE ATTENTION REQUIRED, the EASE WITH WHICH IT IS MANAGED, and THE CHEAPNESS and SUPERIORITY OF THE LIGHT, has gained for it the favorable opinion of those acquainted with its merits.

The Machine takes up but little room; no disagreeable odor is experienced in its use; no fire is applied to the apparatus at all; it can be attached to ordinary gas-pipes used for coal-gas, and is burned through the same kind of fixtures.

These Machines are manufactured in Boston, by the AUTOMATIC GAS-MACHINE CO., and are for sale at their Store, 78 Washington street, Boston, and also at the Agency, MITCHELL, VANCE & CO.'s, No. 620 Broadway, New York.

For further particulars, address—

MITCHELL, VANCE & CO.,
620 BROADWAY, NEW YORK CITY.

PRINCE'S METALLIC PAINT,

AN INDESTRUCTIBLE COATING FOR

IRON, TIN, and WOOD.

It consists of seventy-two parts Oxide of Iron, and twenty-eight parts Cement Lime Stone in the one hundred pounds.

It has much more body than red or white lead. It is warranted perfectly water and fire-proof and to withstand a greater heat on metals, without scaling, than any other paint in use.

It is a perfect cover for all kinds of iron, tin, or wood-work, out-houses, and canvas coverings. It prevents and arrests the corrosion of metals, and is not affected by the action of salt, gases, acids or ammonia.

It hardens under water, as has been fully demonstrated by its application to gas-holders, by many of the largest gas companies in the United States; which companies having thoroughly tested its properties as herein claimed, pronounce in its favor over any other paints in the market, even though sold at double its price.

As a coating for patterns of iron or wood, when mixed with shellac, it is much superior to beeswax, oil, or shellac alone, as has been proven at the large founderies in the country.

For patching boilers and making joints, it is considered superior to red lead, or any other preparation.

For cleaning metals it takes the place of crocus, rouge, and emery, being better and cheaper.

This Paint requires no more oil than dry lead or zinc, and much less than the ordinary mineral paints. It is free from any waste, and possesses a spreading and covering power unequaled.

Terms, by the Barrel or Half Barrel, Four Cents per Pound.

A liberal discount made to parties purchasing by the ton.

A Barrel or Ton will be forwarded to any gas companies desirous of testing its qualities, for which there will be no charge if it does not give entire satisfaction as being the cheapest and most durable of all other Paints in the market.

Also, Prince's Imperial Black Paint, and Prince's Protoxide of Iron.

DANIEL SLOAN, General Agent,
115 LIBERTY STREET, NEW YORK.

Local Agents—S. R. WILLIAMS, 204 South Front st., Philadelphia.
CALVIN GAY, 29 Doane st., Boston.

THE

STANDARD Gold Company

OF COLORADO.

DIRECTORS,
ROBERT BOWNE,
EDWARD WILLIS,
LIVINGSTON SATTERLEE,
ETHAN ALLEN,
S. A. BANKS,
SYLVESTER TAYLOR.

President, ROBERT BOWNE.
Secretary, F. A. MITCHEL.

MINES on FISK LODE,
BOBTAIL LODE,
GROUND HOG LODE,
ENTERPRISE LODE,
and others,

In all, 8,625 feet (linear), and large water powers and mill sites.

Capital issued, 40,000 shares, at $10 per share.

A limited number of shares are offered at the low SUBSCRIPTION PRICE (having been reserved for their customers), by

WILLIAMS & MITCHEL, 12 Wall Street.

SAFEST AND CHEAPEST SYSTEM OF INSURANCE.

WASHINGTON

INSURANCE COMPANY,

172 BROADWAY,

Cor. Maiden Lane, NEW YORK.

CASH CAPITAL, - - -	$400,000.
Assets, June 1, 1864, - - -	600,000.
Scrip Dividend, 1863, - -	60 per Cent.
Scrip Dividend, 1862, - -	60 per Cent.
Scrip Dividend, 1861, - -	60 per Cent.

The Policies entitled to participate receive 75 per cent. of net Profits.

Insures Buildings, Merchandise, Furniture, Rents, Leases, against loss or damage by FIRE, and MARINE RISKS on LAKES, RIVERS and CANALS.

GEO. C. SATTERLEE, President.
HENRY WESTON, Vice Prest.
WM. K. LOTHROP, Secretary.
WM. A. SCOTT, Ass't Secretary.

SATTERLEE & CO.,

BANKERS

AND

STOCK BROKERS,

49 Exchange Place,

NEW YORK.

G. B. SATTERLEE, H. TRACY ARNOLD,
H. A. BOSTWICK, LIVINGSTON SATTERLEE.

Mining Stocks bought and sold at the Regular, Mining, Boston and Philadelphia Boards.

ALBERT H. NICOLAY,

STOCK BROKER AND

AUCTIONEER.

No. 52 William Street,

NEAR WALL ST., NEW YORK.

Special attention given to the Buying and Selling of Gas-Light Companies' Stocks.

PARTICIPATION.

ÆTNA FIRE INS.

COMPANY OF NEW YORK,

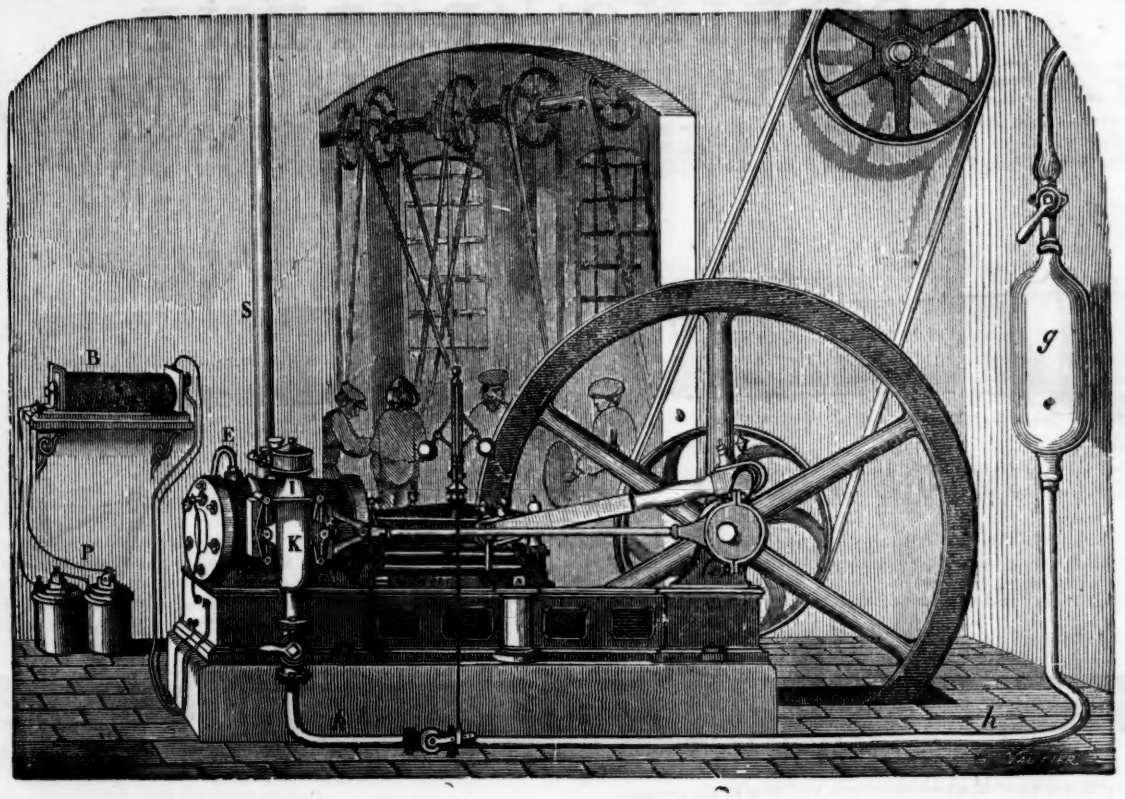
No. 170 Broadway.

CASH CAPITAL,	CHARTERED
$200,000.	**1824.**

The insured receive seventy-five per cent. of the net profits annually, without incurring any liability. When preferred, a discount will be made in lieu of participation in profits.

Scrip Dividend of 1861, - - 50 per cent.
Scrip Dividend of 1862, - - 50 per cent.
Scrip Dividend of 1863, - - 50 per cent.

JACOB BROUWER, *President.*
H. C. BEACH, *Secretary.*
WM. H. BARBOUR, *Asst. Sec.*



MOTEUR—LENOIR.

LENOIR GAS ENGINE.

This is a horizontal engine, in which a piston, by a connecting rod drives a horizontal shaft.

The gas enters by the pipe "h" from the regulating reservoir "g," (made of vulcanized india rubber,) which regulates the feeding and the branches connected with the gas-pipe.

The tube, K, receives the gas conveyed by the pipe "h," and conducts it to the valve, which opens and closes alternately, by means of a rod moved by an eccentric wheel fastened to the end of the shaft.

Two of Bunsen's piles, P, sufficient to produce the electricity are placed at a little distance from, and in communication with a Ruhmkorff electric apparatus, B. The electric current of this apparatus is conducted by means of insulated wires to the electricity distributor "m," placed on the front of the frame, while the current of electricity and its arrival at the inflammator, inserted at each end of the cylinder, is directed by the movement of the piston-rod, which, by an ingenious combination, impels a small movable slide before the distributor.

The burnt gas, after having performed its functions in the machine, escapes, by means of a valve, through a pipe, S, and the water designed to cool the interior of the cylinder enters through a double passage, by means of a pipe situated near the escape-valve, and goes out by the pipe, E.

A two horse and a half horse Engine are now in practical operation at the brass cock manufactory of Mr. A. Carr, *No.* 135 *Mercer St, between Prince and Houston Streets,* New York where those inter ested are invited to call and examine them.

THE LENOIR GAS ENGINE

Requires no Fire and makes no Smoke,

No Noise, no Dirt, and is thoroughly safe.

It is propelled by the expansion of Air, dilated by the combustion of Gas within the cylinder, ignited by the

ELECTRIC SPARK.

ROBBINS' PATENT
GAS AND WATER JOINT.

THE PROPRIETORS of this unrivalled joint are now prepared to introduce it to general use, and to guarantee that, in all respects, it will fulfil perfectly all the requirements of either water, gas, or steam. It is a joint which remains in all situations absolutely tight.

The following illustrations, with the appended explanations, will give a good idea of the improvement:

Fig. 3.

Fig. 1.

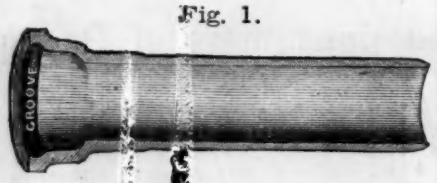


Fig. 2.

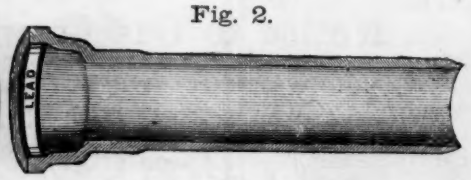


Fig. 4.

FIG. 1. Is a sectional view of a pipe showing a groove to receive a lead ring.

FIG. 2. Is a sectional view of a pipe showing a lead ring in the groove.

FIG. 3. Represents a former which is used in the bell end of the pipe while casting the lead ring. Before using the former, however, a strip or belt of India rubber is first inserted in the socket, against which the former rests to prevent the lead escaping from the groove while being cast. Upon the cooling of the lead, the former and rubber ring are withdrawn from the socket, and the lead ring is left projecting inwards from the groove all around, forming an indestructible packing to receive the spigot-end of the pipe.

FIG. 4. Shows two pieces of pipe in connection with an hydraulic jack, by which the spigot-end of the pipe (which is cast tapering and may be cast in a chill), is forced into the lead ring in the groove which perfects the joint. A, represents the jack; B, B, the chains by which the pipes are drawn together; and C, C, pieces of pipe.

This ring joint packing may be cast at the foundry or any convenient place, and when delivered at the ditch, may be laid, and perfect joints formed, by any laborer, above or below the surface, or in ditches filled with water, there being *no joint ditching required*, and it can be laid with very great rapidity.

Among the economies realized by this joint may be enumerated, the saving in the weight of the pipe, in the amount of lead required to be used in forming the packing, in the labor of ditching, and in laying the pipe.

The bell or socket may be cast one-half the usual length, as the width of the groove requires, but from a half to one and a half inches, according to the size of the pipe, thus saving in the total weight about two hundred pounds per ton.

The weight of lead required to form this joint, as compared with the amount of lead used in forming a joint according to the old method, is fully seventy-five per cent. less, only so much being required as to maintain the compensating principle, or enough to allow (upon the raising or depressing of the line of pipe out of a direct line) what is lost upon one side of the ring packing, to take its place upon the other; thus securing flexibility of the joint without affecting its reliability. The use of yarn or hemp packing is dispensed with, the cost of which is an entire saving as compared with the old method of making joints.

The saving of labor in ditching is the total amount usually expended in digging joint-holes, there being *no joints to be caulked.*

The saving in labor in laying pipe furnished with this joint is a sum equal to the whole cost of carrying lead, fuel, ladles to the ditches, casting the lead, bailing out water, and the entire labor of caulking, less only the sum charged for casting the lead ring packing at the foundry, which is comparatively trifling. This last-mentioned economy has been estimated by the best engineers at seventy-five per cent., or the same as the saving in the quantity of lead used.

The cost of pipe cast from our patterns is the same per ton as pipe cast for the old form of joint. The principal iron-founders propose to charge the same price.

We have submitted these joints in water-pipes to a pressure of two hundred and fifty pounds to the square inch, and they have remained perfectly tight. It has also been submitted for months in gas-pipes to the ordinary pressure of our city gas-mains, without any leakage whatever. We are aware that these statements may be deemed by many extravagant, but the merits of the improvement warrant them all, and the most skeptical may be fully convinced by an investigation of its value, and by witnessing the tests to which we submit it, or by its use under any conceivable circumstances.

TESTIMONIALS.

OFFICE OF THE WATER COMMISSIONERS,
CITY HALL, JERSEY CITY, October 14th, 1863.

Dear Sir,—On the 26th of May last, about two hundred and sixty feet of cast-iron water-pipes, six inches in diameter, with joints constructed according to your invention, were laid for the Jersey City Water-Works, in Prospect street.

The operation of uniting the joints of the pipes, was performed with remarkable facility, and with an important saving in time, materials, and labor. The joints proved perfectly water-tight, after turning the full head of water on the pipes.

In my opinion, your invention has proved entirely successful, and will be found highly beneficial to water companies.

Yours, respectfully,
ROBT. C. BACOT,
Superintendent and Engineer, Jersey City Water-Works.

MR. R. C. ROBBINS.

ENGINEER'S OFFICE, CROTON AQUEDUCT DEPARTMENT.

Dear Sir,—I have examined your plan for making joints in cast-iron water pipes, and have a report from one of my assistants, of certain experiments made by you, to prove the certainty and economy with which the joints can be made, and their stability when finished.

I think the experiments showed that the joints could be made quite as rapidly, if not more rapidly, than those made in the ordinary method now in use; the quantity of lead used was less than that required in the common joint, and no yarn packing was required. In these respects, your joint seems superior.

After the joints were made, a pressure of three hundred pounds to the square inch, was put upon the pipe in such a manner as to test the efficiency of the joint to prevent both leakage of water, and separation of the pipes from each other longitudinally. This pressure failed to produce either leakage at the joint, or separation, so long as the pipes lay in a direct line; but on deflecting them six and a half inches, in a length of twelve feet, the joint commenced leaking. It is fair to add, that this is a greater deflection than would often be found necessary in laying pipe.

I think the efficiency of the joint in both the points tested in this last experiment, might be increased by increasing the quantity of lead, both in thickness and width.

Altogether, the result of the experiments was such that I have determined to make a more thorough test of your invention by putting down about one thousand feet of pipe, when we commence our operations for the coming season.

The diameter of the pipe subjected to experiment, was six inches, and is the same size that I propose to put down next year.

I am, very respectfully, your obedient servant,
A. W. CRAVEN, Chief Engineer, &c.

To R. C. ROBBINS, Esq., Jersey City.

METROPOLITAN GAS-WORKS,
ENGINEER'S OFFICE, NEW YORK, October 9th, 1863.

Dear Sir,—The undersigned had the pleasure of being present at an experimental test of your patent joint for gas and water pipe, made at the yard of the Croton Aqueduct Department, and cheerfully testify to the results obtained, namely:

First experiment was made with two lengths of eight-inch pipe, jointed together, when a pressure of three hundred pounds to the square inch was applied. This pressure did not force the pipe apart, nor start the joints, but they remained, during this experiment, perfectly tight.

Second experiment was made by deflecting the pipe five inches, which is about equal to eighteen inches in one hundred feet, and the same pressure applied, which caused a small leak at the joints.

Third experiment was made by taking the pipes apart and rejointing them, when the same pressure was applied when lying straight and when deflected; at this experiment there was no leakage.

From these severe tests it is my impression that the superiority of your patent joint has been made manifest, and that it must eventually supersede the old way of jointing pipes together, saving both time and material.

Wishing you success in your enterprise,

I am, very respectfully, yours, &c.,
AMBROSE J. WHITE, Engineer.

To R. C. ROBBINS, Esq.

OFFICE OF THE METROPOLITAN GAS-LIGHT COMPANY,
NEW YORK, October 9th, 1863.

Dear Sir,—Having been present at the testing of your patent joint for gas and water pipe, at the yard of the Croton Aqueduct Department, I can testify to the results as stated by Col. A. J. White and fully concur with him in the opinion expressed in his letter to you of this date.

Very respectfully, yours,
W. TITUS, Secretary.

R. C. ROBBINS, Esq.

NEW YORK, October 23d, 1863.

Gentlemen,—I am pleased to be able to inform you, that we are fully satisfied that we have done well in adopting your "Improved Joint," in the construction of an aqueduct which we are now building on Oil Creek, Northwestern Pennsylvania.

We have ten miles of three and four inch pipe to lay this season, and, in our estimation, the perfection of the joint, economy in lead, and rapidity with which the pipe can be laid, render it entirely preferable to any other method of laying pipe.

Our Mr. Hutchings advises us that he is putting down the three and four inch pipe at the rate of twenty-five to thirty lengths per hour, with two men in the trench. We are much pleased with this result.

Respectfully yours,
HUTCHINGS & FOSTER.

MESSRS. R. C. ROBBINS & Co.

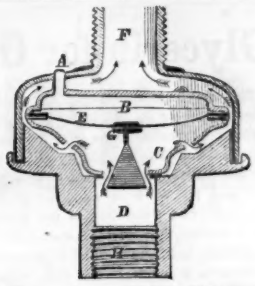
For further information, or for prices and terms, which will be very reasonable, apply to

R. C. ROBBINS & CO.,
No. 218 FULTON STREET, NEW YORK

THOMPSON'S

PATENT

AUTOMATIC GAS CONTROLLER.



Notice to Gas Companies and Consumers of Gas generally.

WE RESPECTFULLY INVITE YOUR ATTENTION TO THE FOLLOWING TRUTHFUL DESCRIPTION OF THE construction and operation of this recent and most important invention; its application to every street lamp, and on the fixtures within the works of the Gas Companies, as well as for the use of the general consumer, will be found to effect perfectly and reliably, the object so long sought for, viz.: **a perfect control of the Gas under varying pressures, emitting the Gas at the burner without force, and without increase or diminution of quantity, and hence promoting the highest possible illuminating power of the Gas.**

THE AUTOMATIC GAS CONTROLLER

Is designed to occupy the place of the gas-burner. Within the circumference of a small cylinder, below the burner, is placed a conical valve, attached to a movable diaphragm, the valve and valve seat is proportioned, so that under a supply of Gas, varying in pressure from four-tenths to five inches, the burner will continue to produce the same consumption and development. The unerring accuracy of movement of the Diaphragm at every change of pressure, whether gradual or sudden, and its positive control of the valve which admits, by its proportionate increased or diminished aperture, the same unvarying amount of Gas, has elicited the unqualified approbation of engineers and other experts in the profession.

The simplicity of its construction, and materials used, are a sure guarantee of its durability and continued successful operation. They afford to the consumer of Gas the advantage of a **superior light, with the greatest possible economy**; and for the Gas Company, they control the Street Lamps, affording a more satisfactory light for the public, without waste.

The public are invited to witness its operation, at the Office of the Company; and samples will be sent to Gas Companies for experiment, on application by letter or otherwise.

G. W. THOMPSON & CO.,
Office, 52 GREENE ST., (up stairs.)
A. L. BOGART, AGENT, 592 BROADWAY,
New York.

We are permitted to refer to the following Gentlemen, who have thoroughly examined our Gas Controller:

GEO. H. KITCHEN, Inspector of Gas Meters, 561 Broadway.
CHAS. ROOME, President Manhattan Gas Company.
J. H. ADAM, President New York Gas Company.
PETER COOPER, Cooper Institute.
JOHN A. DUFF, Olympic Theatre.

THE AMERICAN METER CO.,

Organized under the General Manufacturing Laws of the State of New York.

SAMUEL DOWN, PRESIDENT. HENRY CARTWRIGHT, VICE PRESIDENT. RICHARD MERRIFIELD, SECRETARY AND TREASURER.

TRUSTEES.

SAMUEL DOWN, WILLIAM HOPPER, R. H. GRATZ, HENRY CARTWRIGHT, RICHARD MERRIFIELD.
THOMAS C. HOPPER, *Superintendent at Philadelphia.*

This Company is now prepared to furnish WET AND DRY GAS METERS, STATION METERS, GOVERNORS, PRESSURE INDICATORS REGISTERS, SERVICE and METER COCKS, and all other articles in their line appertaining to the use of Gas-Works.

The combination of Mechanical and Scientific Skill, and the long experience of the several members of the Company, is a sure guarantee of durability, accuracy, and excellence of workmanship. Orders addressed

AMERICAN METER COMPANY,

512 WEST TWENTY-SECOND STREET, NEW YORK,
ARCH AND TWENTY-SECOND STREETS, PHILADELPHIA,
1 BARRETT STREET, BOSTON, will meet with prompt attention.

STEAM-PUMPS.

WORTHINGTON'S STEAM PUMPS, extensively used by Gas-Light Companies. For Sale at greatly Reduced Prices.
Also, a new and highly successful Pump, driven by water pressure, requiring no attention or repairs, and the most economical water motor yet constructed.
Patent GATES, for Water and Steam-stops.
HENRY R. WORTHINGTON,
61 Beekman street, N. Y.

WEST'S IMPROVED PUMPS, the most Simple, Durable, and Powerful, and the Cheapest in use.
J. D. WEST & CO.,
179 BROADWAY, N. Y.

GEO. H. KITCHEN & CO.,
NEW PATENT
GAS APPARATUS
For Country Residences, Public Buildings, &c.,
FROM $300 UPWARDS.
EVERY DESCRIPTION OF GAS FIXTURES.
Gas Fitting in all its branches.
561 Broadway,
NEW YORK.

TO GAS COMPANIES.

THE UNDERSIGNED DESIRES TO undertake the supervision of several small Gas-works, to visit and examine them as often as may be necessary; to obtain and inspect their coal, castings, fire-brick, and other materials; and to manage their general business in such a manner that they shall be under such supervision as is now attainable in large works, at much increased cost. Also, to advise as general Consulting Engineer and expert in practical chemistry.
CHAS. M. CRESSON,
Late Asst. Engineer of the Philadelphia Gas-works,
417 Walnut st., Philadelphia.

To Gas Companies.

A YOUNG MAN, FROM ENGLAND, thoroughly educated, and who has had nine years experience in the Newcastle-under-Lyne Gas-Works, England, as an assistant Manager, desires a similar situation in some Gas-Works in the United States. He has credentials of capacity for such a position.
Address, M. C. P. LAWTON,
Office GAS-LIGHT JOURNAL,
15 Nassau street.
112 New York.

GLYCERIN
FOR
Filling Wet Gas-Meters,
Cheaper than Whisky or any other substance.

We have furnished the Cincinnati Gas and Coke Company 300 barrels Glycerin, for filling their wet meters, and are now ready to supply other Gas Companies at the lowest cash prices.
We warrant our Glycerin not to corrode the meter metal, nor to freeze at the lowest ordinary temperature, nor to evaporate.
HARTMAN & LAIST,
Manufacturing Chemists,
Cincinnati, O.
Office 64 Sycamore.

NEW YORK FIRE-BRICK and Clay Retort Works. (Branch Works at Kreischerville, Staten Island.)
B. KREISCHER, office 56 Goerck street, corner Delancy street, New York.
GAS RETORTS, TILES and FIRE-BRICK of all shapes and sizes. FIRE MORTAR, CLAY, and SAND. Articles of every description made to order at the shortest notice. B. KREISCHER.

WOODEN PURIFYING TRAYS.

PATENT
Conically Slotted Solid Wood Sieves
FOR GAS PURIFIERS.
CAUTION
TO
GAS MANUFACTURERS.

The Conically Slotted Solid Wood Tray was patented 21st October, 1862, by N. O. Hawxhurst, assignee of Wm. Combe, and all persons are cautioned against purchasing such trays of R. G. Hunt, or any other person except the subscriber, as it is a direct infringment of said patent. The following companies are now using these trays.

Manhattan, New York,
Williamsburgh,
Brooklyn,
Albany,
Baltimore,
Philadelphia,
Chicago.
Louisville,
And numerous others.

Orders received by mail or otherwise.
JOHN L. CHEESMAN,
147 Ave. C, New York City.

Glycerin for Gas Meters.

This article is superior to any fluid ever before used for Wet Meters, and we cannot better set forth its advantages than by giving the following letter from the Superintendent of the Covington Gas Co. The superiority of our Glycerin over all others in the market, for this purpose, is admitted by every Company that has used it. We have sold, the past winter, to the Cincinnati Gas-Light and Coke Co.; to the Gas Companies of Covington, Ky.; Dayton, Springfield, Portsmouth, Urbana, and Piqua, Ohio Richmond, Ind., and Buffalo, N. Y, to whom we refer.

Glycerin is much cheaper than Whisky is now, or likely to be hereafter, and not evaporating, greatly increases the economy of its use.

OFFICE OF THE COVINGTON GAS-LIGHT CO.
COVINGTON, KY., Feb. 18, 1864.

MESSRS. W. J. M. GORDON & CO.:

Dear Sirs,—It affords us great pleasure in testifying to the superiority of the Glycerin Fluid purchased from you for filling the Wet Meters now in use by the Covington Gas-Light Company.

The difficulty of finding a non-evaporating and anti-freezing mixture for Wet Meters, has, in my opinion, been overcome by the use of your Glycerin Fluid.

I have had it in constant use for the past four months, and during that period the thermometer has ranged as low as 14° below zero, and after careful examination, I have found the fluid in the same condition as when first put in the Meters, and without the slightest discoloration.

Its non-evaporating quality does away with the hitherto unavoidable expense of filling the Meters monthly, and renders Wet Meters no longer objectionable.

In fact, I can cheerfully recommend it as being cheaper and better than any other Fluid or Mixture now in use.

Very respectfully,
S. S. STRATTON, *Sup't Cov. Gas Co.*

We have been engaged in Manufacturing Glycerin the past six years, and from our advantage in material and the large amount we make, are enabled to offer it lower than any manufacturer in this country. We will be pleased to quote prices or to give further information.

W. J. M. GORDON & BRO.,
MANUFACTURING
CHEMISTS & DRUGGISTS,
N. E. Cor. Central Avenue & Eighth St.,
Laboratory, Miami Canal, bet. Third & Fifth Sts.,
CINCINNATI, O.

The most Useful Invention of the Age!
PATENT
COSMOPOLITAN FURNITURE PASTE!
FOR POLISHING AND RESTORING
Furniture, Pianos, Marbles, Carriages,
&c., &c.,
SUPERIOR TO VARNISH.

☞ *DRIES INSTANTANEOUSLY.* ☜

It brings out the grain of the wood in all its original beauty, and immediately after being applied, the article polished is perfectly dry, thus possessing a very great advantage over varnish or any kind of liquid polish.

It will keep in any climate, and is always ready for use.

ONE BOX IS SUFFICIENT TO RESTORE AN ENTIRE HOUSE OF FURNITURE.

Price 75 Cents per Box. . Double size $1.25.
Each package bears our trade mark.
A LIBERAL DISCOUNT TO DEALERS.

For sale Wholesale by
H. B. HERTS BROS.,
52 JOHN ST., N. Y.

BY ROYAL LETTERS PATENT.

HE T'S & CO'S
AMALGAMATED
ALUMINUM, ZINC AND PLATINA
PENS.
WARRANTED ANTI-CORROSIVE.

In introducing this invention, Messrs. HERTS & Co. beg to call attention to the following advantages combined in these Pens:

They possess the Anti-corrosive properties of the Gold Pen.

The Freedom of the Quill, and

The Flexibility of the Steel Pen.

Thus *combining* in *themselves* every advantage found in other pens; and by their anti-corrosive properties entirely obviating all the objections hitherto existing against the use of Metallic Pens.

Another advantage peculiar to these Pens, is that they *improve* after being a *short time in use*, and may be left in the ink without fear of injury, as they *never need wiping*.

THE No. 808 "medium points," are adapted for *office use* and *general business purposes*.

THE No. 909 "extra fine points," are adapted for *Ledger, Heading, Posting, Engrossing, Ladies and School use.*

The undersigned have given HERTS & Co's Pens a trial, and are satisfied to recommend them to the general public.
FOWLER & WELLS.

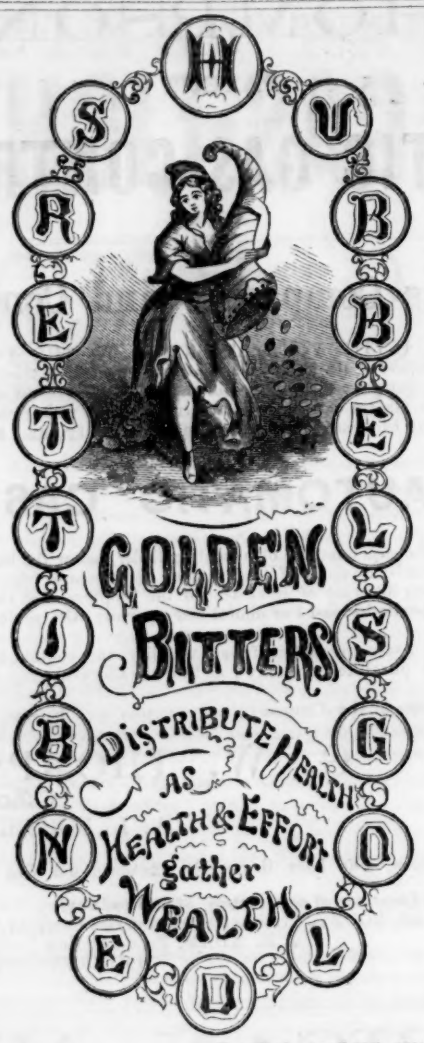
Manufactory, Bradford Works, Birmingham,
ENGLAND.

Orders for the United States, Canada, South America, and the West Indies, must be addressed to

H. B. HERTS, 52 John St, New York,
SOLE CONSIGNEE.

from whom samples may be obtained *gratis*, on application by mail or personally.

The Am. Advg. Agency, 389 Broadway, N. Y., will receive orders for the above-named Pens.



New York, April 18th, 1864.

* * * * * *

We respectfully invite your attention to and consideration of the justly celebrated and reliable remedy for DYSPEPSIA, HEARTBURN, DEBILITY and PROSTRATION. The Proprietors are proud to acknowledge the unparalleled success which has attended the sale of their valuable preparation, known in nearly every portion of the civilized world as the

"GOLDEN BITTERS."

We risk nothing when we term them a *valuable preparation*, for they are one of the few articles of the present day which are not a humbug; and we are willing and able to satisfy any person or persons who will call upon us, that the celebrated "GOLDEN BITTERS" are a genuine *bona-fide hygienic* article. It is the wish of the proprietors that the virtue of the article be tested before condemning. A decision of their merits by any one who has tried them, is worth a million of purchased bogus testimonials.

For Creating a Healthy Appetite

they are invaluable, and are unequalled as a TONIC. They are mild in their action, and operate by giving *vigor* and *strength* to the system,—not by any change they produce in the solids, but through the medium of the living principle.

They are Purely Vegetable,

being composed of Gentian Root, Calamus, Sassafras, and many other remedial agents of the Vegetable world, all preserved in Jamaica Rum and Sherry Wine.

As a Beverage,

They are the most *wholesome, invigorating* and *palatable* stimulant ever offered to the public. And the fact of their being prepared chemically and scientifically, precludes the possibility of a bitter, unpleasant taste, common to Bitters generally offered for sale. We especially recommend them to LADIES, and particularly to those suffering from

DEBILITY, WEAKNESS, AND PROSTRATION.

Half a wine glass of these "Bitters" three or four times a day, will produce a remarkable healthy change in persons greatly debilitated.

The "Golden Bitters" have been tried and not found wanting. They are put up in our own *Patent* quart bottles, and for sale by Druggists, Grocers, &c., throughout the world. Each bottle bears a fac-simile of the signature of Hubbel & Co.

GEO. C. HUBBEL & Co, Sole Proprietors.
CENTRAL DEPOT, American Exp. Building, New York.

THE GOLDEN BITTERS.—We are not an advocate of stimulants of an alcoholic character; indeed we deprecate this "daily tonic" idea—this "morning toddy" which we see offered in all sorts of shapes as a recuperator, invigorator, revitalizer, &c. As a rule all artificial stimulants are dangerous remedies, and must be taken into the system as you would mercury or arsenic, in very small doses. But we have had an opportunity to try the now well-advertised article known as Hubbel's Golden Bitters, and are frank to say that where the system needs building up, where a stimulant is required to aid nature in restoring a lost appetite and infusing a vigorous action to the debilitated functions, we can recommend these Bitters. Hubbel's Golden Bitters are evidently intended to improve the debilitated human system, rather than to tickle the palate, and are, therefore a harmless and safe remedy to keep in the house.—*New York Weekly Day Book.*

YONKERS, May 9th, 1864.

MESSRS. GEO. C. HUBBEL & Co.:

GENTS,—Having used only two bottles of your "Golden Bitters," I can recommend them with the utmost confidence as a Tonic, and particularly for a change of diet and water. It is as well for ladies and children, giving them part of a wine glass two or three times a day. Yours respectfully,
GEORGE C. BARKER.

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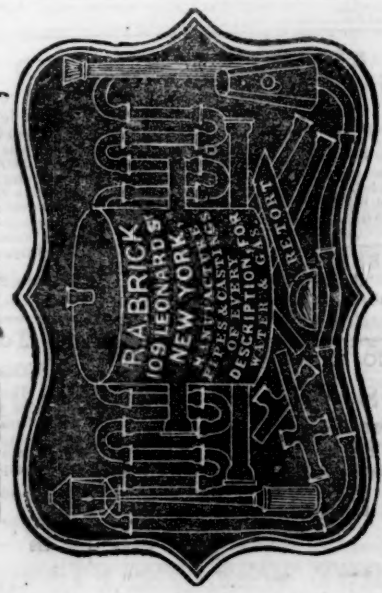

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